CHAPTER 3
AFFECTED ENVIRONMENT

This chapter describes the existing natural resources and the environmental characteristics of the proposed Tucson Electric Power Company (TEP) transmission corridors. The information and data presented in this chapter provide a baseline description of the environment against which the various alternatives from Chapter 2 are evaluated in Chapter 4. The information presented in this chapter serves as the reference point to compare the potential changes to the environment, both positive and negative.

This chapter presents information on land use and recreation, visual resources, biological resources, cultural resources, socioeconomics, geology and soils, water resources, air quality, noise, human health and environment, infrastructure, transportation, and minority and low-income populations.

The Federal agencies recognize that many people value certain areas along the alternative transmission corridors as wild places and have a holistic concern for the natural beauty, undisturbed landscape features, and abundant plant and animal wildlife that characterize those areas. These unique natural characteristics give such wild areas their "sense of place," which includes peoples' visual and aural perceptions of the area's undisturbed sky, natural landscape, water resources, and plant and animal populations. The sense of place also includes the spiritual value that many people associate with these wild areas because of their cultural and religious significance.

The agencies recognize that the natural and cultural characteristics that contribute to a sense of place cannot be measured in the same manner as some other resources in an environmental analysis. However, in order to analyze potential impacts effectively and document the analysis, it is necessary to consider the resource areas individually. Thus, the EIS discussions of affected environment in Chapter 3 and potential impacts in Chapter 4 are divided into distinct resource areas (e.g., visual resources, biological resources, cultural resources). For the Central and Crossover Corridors, unless otherwise indicated, the descriptions provided here are based on Option 1, the sub-route that avoids the Inventoried Roadless Area in the Coronado National Forest.

3.1 LAND USE AND RECREATION

This section discusses the existing land use resources in the vicinity of the proposed project. The discussion includes land use planning, current land use, land ownership, and recreational resources.

3.1.1 Land Use

The following discussion of land use planning, current land use, and land ownership applies to all three proposed corridors. Information specific to the Western, Central, and Crossover Corridors is described separately following the general discussion.

Figure 1.1–2 shows the land ownership or management in the vicinity of the proposed project. The land ownership in the northern portion of all three corridors is primarily private and state trust land, with 1.25 mi (2.01 km) of the proposed corridors on Federal lands managed by the Bureau of Land Management (BLM).

The Arizona State Land Department manages approximately 9.3 million acres of State owned "Trust" lands. Figure 1.1-2 shows the State Trust Lands in the project area. These lands were granted to the State of Arizona under provisions in the federal Enabling Act that provided for Arizona's statehood in 1912. The lands are held in trust for fourteen public beneficiaries including Arizona's public schools and several state supported institutions. The Department functions as the trustee of the State Land and its natural resources. The Department's management of the trust is governed by extensive and detailed provisions in

the Enabling Act (Sections 24-30), Act June 20, 1910, (c). 310,36 U.S. Stat. 557, 568-579), the Arizona Constitution (Article 10), and statutes in A.R.S. Titles 27 and 37. In addition there is extensive case law which governs the Department's procedures and management of the Trust. The Department's mission is to manage State Trust Lands and resources to enhance value and optimize economic return for the Trust's beneficiaries consistent with sound stewardship, conservation and business management principles. The role, in this instance, of the State Land Department is to determine whether to approve an easement for the preferred right of way alignment for a power transmission line as well as a fiber optic communication line incorporated in the power line. In processing an application for a right of way, the Department will consider land status, current uses, existing lessees, affected resources, environmental issues, local and regional land use plans and comments from interested parties as well as other issues that may present themselves in the application process.

The proposed corridors do not cross any Indian reservations or lands reserved under treaty rights by Native American nations, tribes, or communities. The San Xavier District of the Tohono O'Odham Nation is located approximately 1 mi (1.6 km) north of the proposed corridors as they exit the South Substation. The southern portion of all three corridors includes public lands administered by the U.S. Department of Agriculture Forest Service (USFS).

TEP has not finalized the placement of the 125-ft (38-m) right-of-way (ROW) within the 0.25 mi (0.40 km)-wide study corridors. The precise siting of the ROW would involve input from cultural, biological, and visual specialists, after each agency has issued a Record of Decision (ROD), to identify and minimize impacts to each area of land to be disturbed.

Northern Portion. The northern portion of the three proposed corridors, including the South Substation, is located in Pima County. Pima County land development and conservation is guided by policies of the Pima County Comprehensive Plan, implemented by the County Zoning Code within unincorporated areas. The Board of Supervisors adopted the current 2001 Pima County Comprehensive Plan on December 18, 2001, in accordance with the requirements of the Growing Smarter Plus legislation, the preliminary Sonoran Desert Conservation Plan, and requirements provided for in the county Zoning Code (Pima 2003). Within the town of Sahuarita, the Planning Commission oversees a comprehensive long-term General Plan and associated zoning regulations.

All three corridors cross the same Federal lands managed by the BLM, an estimated 1.25 mi (2.01 km) of lands located 1.3 mi (2.1 km) north of the existing TEP Cyprus Sierrita Substation (see Figure 1.1–2, Township 17 South, Range 12 East). These lands are designated as disposal lands under the current Resource Management Plan (BLM 1988).

Coronado National Forest. Each of the three proposed corridors cross the Tumacacori Ecosystem Management Area (EMA), as shown in Figure 3.1–1, which consists of all of the Coronado National Forest land west of Interstate 19 (I-19) adjacent to the U.S.-Mexico border (approximately 203,800 acres [82,475 ha]). The USFS manages this land for sustained multiple use of forest and rangeland resources including fuelwood, grazing, recreation, and mining (USFS 2001a). The specific direction for managing the Coronado National Forest is contained in the *Land and Resource Management Plan for the Coronado National Forest, 1986 as amended* (USFS 1986). The Forest Plan provides for integrated multiple use and sustained yield of goods and services from National Forest System lands and resources in a way that maximizes long-term net public benefits in an environmentally sound manner.

- Portions of the Western Corridor crossing the Coronado National Forest are not consistent with the management direction in the governing Forest Plan. The Forest Plan would be amended to establish a new utility corridor, establish utility corridor width, and change visual quality objectives as fully described in Section 2.1.1.

- Portions of the Central Corridor (Option 1) crossing the Coronado National Forest are not consistent with management direction in the governing Forest Plan. The Forest Plan would be amended to establish a new utility corridor, establish utility corridor width, and change visual quality objectives as fully described in Section 2.1.2.

- Portions of the Central Corridor (Option 2) crossing the Coronado National Forest are not consistent with management direction in the governing Forest Plan. The Forest Plan would be amended to establish a new utility corridor width and change visual quality objectives as fully described in Section 2.12.

- Portions of the Crossover Corridor (Option 1) crossing the Coronado National Forest are not consistent with management direction in the governing Forest Plan. The Forest Plan would be amended to establish a new utility corridor, establish utility corridor width, and change visual quality objectives as fully described in Section 2.1.3.

- Portions of the Crossover Corridor (Option 2) crossing the Coronado National Forest are not consistent with management direction in the governing Forest Plan. The Forest Plan would be amended to establish a new utility corridor, establish utility corridor width, and change visual quality objectives as fully described in Section 2.1.3.

See Appendix H for more details on the Forest Plan amendment process.

Invertoried Roadless Areas (IRAs) on National Forest System lands provide protection for all natural resources, including water, soil, flora, fauna, and air quality, and protect visual resources while providing a potential for unroaded recreation experiences. IRAs encompass approximately 52,788 acres (21,363 ha) within the Tumacacori EMA and are shown in Figure 3.1–1. The Western Corridor is located less than 1 mi (1.6 km) west and south of an IRA, and the Central Corridor (Option 1) passes within 0.25 mi (0.40 km) of an IRA. The Crossover Corridor passes through approximately 3 mi (4.5 km) of an IRA as it goes through Peck Canyon. Under Option 2, both the Central Corridor and the Crossover Corridor would pass through approximately 1.9 mi (3.1 km) of an IRA within the existing EPNG pipeline ROW.

The Roadless Area Conservation Final Rule (36 CFR 294) was published in the Federal Register on January 12, 2001, with an effective date of March 13, 2001. The effective date was extended to May 12, 2001 to allow the incoming Bush Administration time to review these newly adopted regulations. On May 4, 2001, the Secretary of Agriculture announced that U.S. Department of Agriculture (USDA) would implement the Final Rule with the caveat that USDA would consider amending the Final Rule to address concerns expressed by communities, States, and tribes.

Upon adoption, the 2001 Final Rule was challenged in nine lawsuits filed in the District Courts; ultimately, in May 2001, the Idaho Federal District Court issued a preliminary injunction order prohibiting USDA and USFS from implementing the 2001 Final Rule. In July 2001, USFS published an Advance Notice of Proposed Rulemaking in the Federal Register requesting public comment on the long-term protection and management of inventoried roadless areas in the National Forest System. While the Court-ordered injunction was in place, the Chief of the Forest Service instituted interim agency direction for the protection of roadless values in inventoried roadless areas. The interim direction expired in June 2003.

Following several legal challenges, and decisions rendered by the Ninth Circuit Court of Appeals in April 2003 requiring dissolution of the preliminary injunction from the Idaho Court, the Roadless Area Conservation Final Rule (36 CFR 294) was officially effective and binding on management of National Forest System lands. Nevertheless, USDA announced in June 2003 it would implement the 2001 Final

Rule, but would continue pursuing amendments to the rule to address State concerns and requests for limited exceptional circumstances received from several Governors. At the same time, a lawsuit from the State of Alaska were settled with an agreement to exempt the Tongass National Forest from the requirements of the 2001 Final Rule; and a challenge in the District Court for Wyoming found the 2001 Final Rule to be unlawful and permanently enjoined it from implementation. The ruling to permanently enjoin the 2001 Final Rule is under appeal to the Tenth Circuit Court.

In December 2003, USDA adopted a 2003 Final Rule that amended the 2001 Final Rule by exempting the Tongass National Forest from the Rule's prohibitions. In May 2004, the Tenth Circuit agreed to hear appeals on the Wyoming Court's permanent enjoinment of the 2001 Final Rule. In July 2004, USDA published a Proposed Rule for public comment and review to replace the 2001 Final Rule. This new version contains as petition process that would allow Governor's an opportunity to seek establishment of management requirements for inventoried roadless areas on National Forest System lands in their States.

At the same time, USFS announced reinstatement of the Chief of the Forest Service's interim protection measures for inventoried roadless areas. This interim direction is expected to be in effect until January 16, 2006. The July 2004 interim direction (WO-ID-1920-2004-1) establishes policy for the implementation of several aspects of the 2001 Final Rule. With respect to TEP's proposal, the relevant policy affects authorities for approval of certain proposed road construction or reconstruction activities in inventoried roadless areas.

TEP has stipulated that the structure locations, construction areas, and proposed access roads for all three corridors would not enter the following specially designated areas within the Tumacacori EMA (as shown in Figure 3.1–1): Pajarita Wilderness, Chiltipene Botanical Area, and Peña Blanca Lake Recreation Area (TEP 2003). The Pajarita Wilderness is a congressionally designated area comprised of approximately 7,400 acres (3,000 ha), including Sycamore Canyon and Goodding Research Natural Area, designated for its pristine nature and wilderness values, and utilized for recreation. The Chiltipene Botanical Area is an estimated 2,840 acre (1,150 ha) reserve established for the protection and study of Chiltepin wild chilies (*Capiscum annum* var. *glabriusculum*). Peña Blanca Lake Recreation Area is used for year-round water recreation.

Current land use within the Tumacacori EMA includes diverse and dispersed recreational uses, which are described in Section 3.1.2, Recreation. The U.S. Border Patrol conducts routine surveillance in the vicinity of the U.S.-Mexico border, specifically focused on the area south of Ruby Road between the Pajarita Wilderness and Nogales, mostly within the Tumacacori EMA. U.S. Border Patrol activities generally involve accessing the ridgetops to get an open view of the area. A large portion of the Tumacacori EMA (an estimated 164,000 acres [66,400 ha]) is classified by USFS as able to support livestock grazing, and some is currently under permit for livestock grazing. A majority of this capable rangeland is in satisfactory condition (a USFS measure of the health of the vegetation and soil relative to their combined potential to produce a sound and stable biotic community) (USFS 2001b).

- The Western Corridor passes almost entirely through satisfactory rangeland within the Tumacacori EMA.

- The Central and Crossover Corridors pass through a combination of satisfactory and unsatisfactory rangeland within the Tumacacori EMA.

There are an estimated 320 mi (515 km) of USFS system roads within the Tumacacori EMA, both paved and unpaved. There are also numerous unofficial travelways used by recreational and other users of the area, known as wildcat roads, as described in Transportation Section 3.12 and the Roads Analysis (RA)(URS 2003a) for the proposed project. There are approximately 31 vehicular access points to the EMA. The current configuration of the road system serves as a "limiter" to the EMA in accordance with the Forest Plan. Ruby Road is the primary access point to the EMA, as shown in Figure 3.1–1.

Nogales Border Area. The proposed crossing of the U.S.-Mexico border would be the same for all three corridors. In the City of Nogales, where the proposed corridors connect to the proposed Gateway Substation and continue to the U.S.-Mexico border, the City of Nogales Planning and Zoning Department oversees land use. On June 25, 1897, a Presidential Proclamation was signed by President William McKinley to keep lands free from obstruction as protection against smuggling of goods between the United States and Mexico. The proclamation reserved a strip of land 60 ft (18 m) wide, parallel with and adjacent to the U.S.-Mexico border, extending 1 mi (1.6 km) east and 1 mi (1.6 km) west of Monument No. 122 within the City of Nogales, Arizona. Following a recommendation that additional lands be reserved along the boundary, President Theodore Roosevelt signed a Presidential Proclamation on May 27, 1907, reserving a 60 ft (18 m)-wide strip of land parallel with and adjacent to the U.S.-Mexico border on all lands that were not already patented (that is, Indian Reservations, National Parks, Monuments, etc.) to the United States to ensure the integrity of the 60-ft (18-m) strip of reserved land. Similar lands are also designated by Mexico along its side of the land border. The 60-ft (18-m) strip of reserved land is continuous along the United States side of the border from Nogales, Arizona westward to the Colorado River, including the area of the proposed project border crossing (USIBWC 2003). The preservation of the reserved land's integrity is a requirement for TEP to cross the U.S.-Mexico border. TEP has committed that it would avoid construction of project structures within the 60 ft (18 m)-wide reserved lands along the U.S.-Mexico border. TEP's proposed project design is for the transmission line to cross the U.S.-Mexico border using monopole structures located at least 400 ft (120 m) away from the U.S.-Mexico border (TEP 2003).

3.1.1.1 *Western Corridor*

The Western Corridor extends for an estimated 65.7 mi (105 km), from the South Substation to the U.S.-Mexico border, including 9.3 mi (15.0 km) that follows or crosses the EPNG pipeline ROW, as shown in Figure 1.1–2. The length of the Western Corridor within the Coronado National Forest is 29.5 mi (47.5 km).

The Western Corridor, together with the Central and Crossover Corridors, exits the TEP South Substation located within the incorporated area of the Town of Sahuarita and proceeds westerly for an estimated 1.0 mi (1.6 km) before turning south for 1.5 mi (2.4 km). Land use in this area is a mix of undeveloped land and ranch land. The nearest residences to the proposed Western Corridor ROW are a group of about five houses at a distance of approximately 1,000 ft (305 m) from the ROW centerline, south of Sahuarita Road, west of the Town of Sahuarita. Sahuarita High School and Middle School are approximately 4,000 ft (1,200 m) south of the ROW centerline. The corridor turns west across I-19 and continues through Pima County to the southwest, intersecting the existing EPNG pipeline ROW. This area contains industrial properties, a low density residential area (0.2 to 0.4 residents per acre), ranch land, rural undeveloped land, and multiple expansive mine tailings piles from past and ongoing mining operations. On BLM lands, the proposed project would follow parallel to two existing TEP transmission lines (138-kV and 345-kV). The Western Corridor centerline passes approximately 0.19 mi (0.3 km) from a small group of homes along South Avenida Cinco, south of Sahuarita Road, and also approximately 0.19 mi (0.3 km) from a nearby house on West Camino del Toro. The Western Corridor turns south to parallel the

EPNG pipeline ROW for an estimated 5.8 mi (9.3 km) and passes near the existing TEP Cyprus Sierrita Substation.

The Western Corridor continues south past the Cyprus Sierrita Substation then separates from the Central Corridor, continuing southwest and south and enters Santa Cruz County after approximately 10 mi (16 km), passing through primarily undeveloped land, with portions of ranch land and commercial and industrial areas. As shown in Figure 2.1-1, the Western Corridor passes through State Trust lands that are leased to the Caterpillar Corporation, as well as Caterpillar-owned land. The Western Corridor enters the Coronado National Forest 6.0 mi (9.7 km) south of the Santa Cruz County line. The National Forest System lands along the Western Corridor are characterized by natural vegetation set in rolling hills with steep sloped canyons. Paralleling the Pima and Santa Cruz County lines on the National Forest System lands, the Western Corridor passes south along the west side of the Tumacacori and Atascosa Mountains, then meets and runs along the south side of Ruby Road as it turns gradually east at the Pajarita Wilderness. The Western Corridor centerline passes within approximately 1 mi (2 km) of the Pajarita Wilderness, including Goodding Research Natural Area and Sycamore Canyon. The Western Corridor centerline is approximately 2 mi (3 km) from the Chiltipene Botanical Area, and is an estimated 1.5 mi (2.5 km) south of the Peña Blanca Lake Recreation Area. The Western Corridor separates from Ruby Road west of Castle Rock, continuing south of Ruby Road until the Western Corridor intersects the Central and Crossover Corridors.

The Western Corridor, together with the Central and Crossover Corridors, continues through the National Forest System lands, following or crossing the EPNG pipeline ROW to the southeast for several miles to the Coronado National Forest boundary. The proposed corridors exit the Coronado National Forest onto private land containing some commercial and residential development and proceed 0.5 mi (0.8 km) east to the Gateway Substation. From the Gateway Substation, the proposed corridors return to the west through private land then turn south to parallel the Coronado National Forest boundary through an area containing primarily warehouses associated with trucking operations. The proposed corridors pass within 0.35 mi (0.6 km) of a warehouse and apartments on North Mariposa Ranch Road off Arizona State Highway 189. The proposed corridors meet the U.S.-Mexico border approximately 0.62 mi (1.0 km) west of Arizona State Highway 189 in Nogales, Arizona.

3.1.1.2 *Central Corridor*

The Central Corridor extends for an estimated 57.1 mi (91.9 km), from the South Substation to the international border, including 43.2 mi (69.5 km) that follows or crosses the EPNG pipeline ROW, as shown in Figure 1.1–4. The estimated length of the Central Corridor within the Coronado National Forest is 15.1 mi (24.3 km). The Central Corridor follows the same route as the Western Corridor from the South Substation in Sahuarita to an estimated 3 mi (5 km) south of the existing TEP Cyprus Sierrita Substation. Refer to Section 3.1.1.1, Western Corridor, for a discussion of the current land use in this common segment.

The Central Corridor separates from the Western and Crossover Corridors and continues to follow the existing EPNG pipeline ROW to the south. This section passes primarily through grazing areas and land that is undeveloped.

The Central Corridor continues south following or crossing the EPNG pipeline ROW, approaching to within approximately 1.0 mi (1.6 km) west of I-19, passing Amado, Tubac, and Tumacacori. The areas in the vicinity of these towns contain housing developments and some commercial establishments. The Central Corridor centerline passes approximately 0.19 mi (0.3 km) from a house northwest of Tubac (south of Agua Linda Road), and approximately 0.1 mi (0.2 km) from approximately eight houses and a distribution station north of Aliso Springs Road in Tubac. The Central Corridor continues approximately

2.0 mi (3.2 km) south of Tumacacori through undeveloped land, and then enters the Coronado National Forest, adjacent to the EPNG pipeline ROW. Under Option 1, the Central Corridor centerline diverges from the EPNG pipeline ROW for an estimated 1.9 mi (3.1 km) to avoid the IRA, passes along the eastern edge of the Tumacacori and Atascosa Mountains, and then crosses Ruby Road and reaches a point northwest of the Gateway Substation where it rejoins the Western Corridor. Under Option 2, the Central Corridor follows the existing EPNG pipeline ROW and passes through approximately 1.9 mi (3.1 km) of an IRA. National Forest System lands along the Central Corridor (Options 1 and 2) are characterized by natural vegetation set in rolling hills with frequent visible intrusions from the access roads and markers delineating the location of the existing EPNG underground pipeline. The 1.9 mi (3.1 km) deviation from the pipeline route in Option 2 is similar in topography and vegetation.

The Central Corridor centerline passes approximately 6 mi (10 km) east of the Pajarita Wilderness, including Goodding Research Natural Area and Sycamore Canyon. The Central Corridor centerline is approximately 1.0 mi (1.6 km) from the Chiltipene Botanical Area, and is approximately 3.0 mi (4.8 km) northeast of the Peña Blanca Lake Recreation Area.

The Central Corridor is identical to the Western Corridor from the point where they join in the Coronado National Forest to the Gateway Substation and the U.S.-Mexico border. Refer to Section 3.1.1.1, Western Corridor, for the current land use along this common segment.

3.1.1.3 *Crossover Corridor*

The Crossover Corridor extends for an estimated 65.2 mi (105 km), from the South Substation to the U.S.-Mexico border, including an estimated 17 mi (27 km) along the EPNG pipeline ROW, as shown in Figure 1.1–4. The estimated length of the Crossover Corridor within the Coronado National Forest is 29.3 mi (47.2 km). The Crossover Corridor is identical to the Western Corridor from where it exits the TEP South Substation in Sahuarita to where it separates from the Western Corridor in the Coronado National Forest. Refer to Section 3.1.1.1, Western Corridor, for a description of land use within this area.

The Crossover Corridor separates from the Western Corridor and turns east through Peck Canyon for an estimated 7 mi (11.3 km). Lands within the Peck Canyon segment are characterized by a steep-sided canyon, and natural vegetation. An intermittent stream with perennial pools meanders through the bottomland in Peck Canyon. Current land use within Peck Canyon is primarily for recreational use, as described in Section 3.1.2. The Crossover Corridor joins the Central Corridor and the EPNG pipeline ROW upon exiting Peck Canyon on the east side of the Tumacacori Mountains. The distances from the Crossover Corridor to the specially designated areas within the Tumacacori EMA, as shown in Figure 3.1–1, are the same as the distances for the Central Corridor, except the Crossover Corridor is an estimated 3.0 mi (4.8 km) south of the Chiltipene Botanical Area. The Crossover Corridor is identical to the Central Corridor from the point where they rejoin in the Coronado National Forest to the Gateway Substation and the U.S.-Mexico border. Refer to Section 3.1.1.2, Central Corridor, for a discussion of the current land use along this common segment.

3.1.1.4 *115-kV Interconnection of the Gateway and Valencia Substations*

The proposed 115-kV interconnection would be the same for all three corridors. The 115-kV interconnection between the Valencia Substation and the Gateway Substation would be located on privately-owned land and existing right-of-ways. UNS owns the site of the Valencia Substation, and TEP owns the site for the proposed Gateway Substation. The following summarizes land uses within 2 mi (3.2 km) of the proposed 115-kV interconnection

The existing land uses within the project area for the 115-kV interconnection include residential, commercial, industrial, agricultural, parks/recreational, and undeveloped land uses. Residential land use includes low, medium, and high- density residential areas, as well as mobile home parks within and surrounding the city of Nogales. A series of apartment complexes are the closest residences to the proposed interconnection and are located approximately 200 ft (61 m) north at Milepost 2.7. A mobile home park is located approximately 900 ft (274 m) north of the proposed 115-kV interconnection at Milepost 1.5.

Commercial land uses are located throughout the area and are often found in mixed-use areas (commercial, light industrial, residential). The largest concentrations of commercial areas are along US 89 and Mariposa Road. Link 10 (Figure 1.1-5) of the proposed interconnection parallels a commercial area for approximately 0.6 mi (1 km).

Industrial uses in the study area are primarily associated with trade and distribution and are located along US 189 and Mariposa Road. These industrial uses are often associated with mixed-use areas (commercial, light industrial, residential). The proposed Gateway Substation is located directly north of an industrial area and the proposed connection to the Valencia Substation parallels an industrial area on the west and south for 1.3 mi (2.1 km).

Agriculture land uses within the 115-kV transmission line project area include a small corral and associated farm complex and animal grazing in the western portion of the project area. The corral and farm complex are located within 150 ft (46 m) of the proposed interconnection near where it turns to the west. The majority of the area west of the project is either used for grazing or is undeveloped.

The Coronado National Forest is located approximately 0.5 mi (0.8 km) west of the proposed interconnection, and a small (approximately 0.5 square mi [1.3 km^{2}]) area of State Trust Land is located approximately 1.25 mi (2.0 km) southeast of the proposed route.

3.1.2 Recreation

The following discussion of existing recreational resources applies to all three proposed corridors. A discussion of information specific to the Western, Central, and Crossover Corridors on the Coronado National Forest is presented separately in order that the USFS Recreation Opportunity Spectrum (ROS) tool for recreation planning and management can be used (USFS 1990).

There are no state parks, national parks, or national monuments in any of the proposed corridors. The nearest state park is the Tubac Presidio State Historic Park, located off I-19 in Tubac, approximately 6.0 mi (9.7 km) east of the Western and Crossover Corridors, and an estimated 1.5 mi (2.4 km) east of the Central Corridor, as shown in Figure 1.1–4. This park occupies 10 acres (4 ha) and is a day use only facility featuring remnants of a Spanish military fort and other historic and archaeological resources. Tumacacori National Historic Park is located off I-19 south of Tubac. This park occupies 360 acres and has three separate components focused on the former Spanish Colonial missions of Tumacacori, Guevavi, and Calabasas. The Tumacacori unit is closest to the proposed alternatives, located 4.6 mi (7.4 km) east of the Western and Crossover Corridors, and approximately 0.8 mi (1.3 km) east of the Central Corridor, as shown in Figure 1.1-4. There are no designated Wild and Scenic Rivers within the project vicinity. USFS determined a 5-mi (8-km) segment of Sycamore Canyon mostly within the Pajarita Wilderness to be eligible for designation as a Wild and Scenic River (USFS 2004b), although no designation has been made to date. This eligible segment of Sycamore Canyon is outside the three proposed corridors, although the Western Corridor crosses Sycamore Creek north of the potentially eligible segment (see Figure 3.7–2).

Recreation activities in the vicinity of the proposed project outside the Tumacacori EMA are generally similar to those within the Tumacacori EMA, as described in the following sections. These include hiking, biking, birding, photography, rock climbing, horseback riding, and off-highway vehicle use. Birding is recognized as a frequent recreation activity in the proposed project vicinity. A number of trails leading onto the National Forest System lands east of the Tumacacori Mountains are used for recreation. The southeastern Arizona Bird Observatory has identified 25 birding hotspots in southeastern Arizona. The two nearest to the proposed project are San Xavier del Bac Mission, approximately 10 mi (16 km) north of the South Substation, and the Buenos Aires National Wildlife Refuge, approximately 25 mi (40 km) west of the Western and Crossover Corridors, and approximately 30 mi (48 km) west of the Central Corridor (SABO 2001).

The setting in which recreation activities take place in the Coronado National Forest is analyzed using the ROS. By recognizing that people desire specific settings for recreational activities, the ROS provides a framework for understanding the characteristics that contribute to specific recreational settings. In applying the ROS, USFS classifies National Forest System lands into one of seven major classes: (1) Urban, (2) Rural, (3) Roaded Natural, (4) Roaded Modified, (5) Semi-Primitive Motorized, (6) Semi-Primitive Non-Motorized, and (7) Primitive. Based on these classifications, the ROS identifies seven characteristics that contribute to the experiences provided by a recreational area and indicate the limits of acceptable change to each characteristic within a recreational class. These characteristics, or setting indicators, are shown in the following text box (USFS 1990).

The Tumacacori EMA is one of twelve sky island mountain ranges that comprise the Coronado National Forest in Southwestern Arizona. "Sky Islands" or "sky island mountains" are terms used to denote mountain ranges that are isolated from each other by intervening valleys of grassland or desert (USFS 1999). USFS has classified all areas of the Tumacacori EMA as either Rural, Roaded Natural, Roaded Modified, Semi-Primitive Motorized, Semi-Primitive Non-Motorized, or Primitive, as shown in Figure 3.1–2. Within the Tumacacori EMA, the ROS class Semi-Primitive Motorized comprises the greatest total area, an estimated 128,519 acres (52,010 ha), out of a total of 203,799 acres (82,475 ha).

Certain setting indicators such as remoteness, access, and social encounters are impacted by operations of U.S. Border Patrol in the project vicinity. For instance, an otherwise remote area may be a common location for U.S. Border Patrol vehicle activity. Therefore, to ensure a complete ROS analysis, a general treatment of U.S. Border Patrol operations is included in this section, although these operations are not classified as a recreational activity.

Recreation Opportunity Spectrum Definitions

Urban

A setting characterized by easy access (usually paved roads), many built elements, and often lots of people. Urban settings generally have structures (such as visitor centers or astrophysical complexes) or others facilities (such as electronic sites) that dominate the natural setting. Urban areas on national forest lands are usually small in size and constitute a very small percentage of the land.

Rural

Rural settings include most developed recreation areas (such as campgrounds and picnic areas) as well as many other minor developed sites. The natural setting is the attraction but there are rustic facilities such as restrooms, roads (often paved), walkways, and picnic tables. Rural areas on national forest lands are generally small in size and constitute a very small percentage of the Forest.

Roaded Natural

Roaded Natural settings are corridors along major forest roadways where visitors drive to enjoy the scenery and are often on their way to a developed recreation site such as a campground or picnic area. The natural setting is the focus, but nodes of ROS Urban and Rural are commonly found along these corridors. There are generally some encounters with other visitors occur along roads. Individual buildings and structures (such as very small administrative sites or individual summerhomes) are occasionally encountered within these corridors.

Roaded Modified

Roaded Modified settings are corridors along less-used but well-maintained forest roads where visitors drive to enjoy the scenery and get away from other people and developed sites. The natural setting is the focus and visitors are often looking for a place to set up their own camp, explore the backcountry, or find solitude.

Semi-Primitive Motorized

Semi-Primitive Motorized settings are areas with primitive roads (i.e., high clearance and/or 4-wheel drive). In this setting visitors find more risk and isolation, and encounters with other people are uncommon. People use these areas for a wide variety of activities, both recreational and other, including horseback riding, mountain biking, hunting, mining, and cutting firewood. Generally the only facilities in these areas are primitive roads and trails.

Semi-Primitive Non-Motorized

Semi-Primitive Non-Motorized settings are roadless natural areas that visitors use for a wide variety of dispersed recreation activities. These areas have no facilities other than trails and are similar to Primitive areas except that they can be small areas. Encounters with other people are rare.

Primitive

These are the most remote parts of the forest. Primitive settings are large (over 5,000 acres) wilderness or wilderness-like areas where visitors seek a totally natural setting, challenge, discovery, and solitude. These areas have no facilities other than trails and encounters with other people are rare.

Recreation Opportunity Spectrum Setting Indicators

Access: The type and mode of travel, such as trails or roads, with more difficulty designed into travel as one moves towards the Primitive end of the spectrum.

Remoteness: The extent to which individuals perceive themselves as removed from the sights and sounds of human activity, such as transmission lines, with primitive areas being farther removed from indications of human activity.

Social Encounters: The number and type of other recreationalists met along travelways, or camped within sight or sound of others, such as a group of hikers, with fewer interactions towards the Primitive end of the spectrum.

Visitor Management: The degree to which visitors are regulated and the level of information and services provided for visitor enjoyment, such as interpretive signs, with little or no regulation and on-site information towards the Primitive end of the spectrum.

Facilities and Site Management: The level of site development, such as foot bridges across washes, with little or no user comfort and site protection facilities towards the Primitive end of the spectrum.

Naturalness: The degree of human alterations such as trail clearings in the landscape versus undisturbed nature, with settings that are visually more natural towards the Primitive end of the spectrum. Naturalness is indicated by the Scenery Management System (SMS) Scenic Integrity Level.

Visitor Impacts: The degree of visitor use impacts on the environment, such as alterations to wildlife habitat, with little or no impacts towards the Primitive end of the spectrum.

3.1.2.1 Western Corridor

The Western Corridor includes approximately 30.0 mi (48.2 km) within the Coronado National Forest, as shown by the 0.25 mi (0.40 km)-wide study corridor in Figure 3.1–2. As described in this section, the entire length of the Western Corridor on National Forest System lands provides opportunities for recreation, which is currently utilized to varying degrees, including hiking, hunting, birding, photography, rock climbing, biking, horseback riding, all-terrain vehicle use, camping, picnicking, fishing, metals claim prospecting, and scenic driving on Ruby Road.

The Western Corridor crosses two areas of Semi-Primitive Motorized land (west of the Tumacacori Mountains and near Nogales) for a total of an estimated 21.3 mi (34.3 km). Along Ruby Road, the Western Corridor crosses Roaded Modified land for approximately 7 mi (11 km) and Roaded Natural land for an estimated 1.7 mi (2.7 km). The Western Corridor passes within 0.25 mi (0.40 km) of Semi-Primitive Non-Motorized land on the west side of the Tumacacori Mountains. The number of recreational users is highest in the Roaded Natural areas, decreases beyond Peña Blanca Lake in the Roaded Modified areas, and is lowest in the Semi-Primitive Motorized areas along the western side of the Atascosa and Tumacacori Mountains. However, as described below, attributes such as the remoteness of certain areas provide a unique, highly valued experience for visitors that venture into such areas. For each ROS classified area, the current setting indicators and recreational uses are described below.

Western Corridor Roaded Natural Area. The destination of a majority of visitors to the Tumacacori EMA is Peña Blanca Lake Recreation Area, accessed by traveling west on Ruby Road to the west end of the Roaded Natural area. Roaded Natural settings are road corridors where people drive to enjoy the scenery and are often on their way to a developed site such as a picnic area. Activities at Peña Blanca Lake Recreation Area include year-round picnicking and fishing. A large percentage of the visitors to this location are from Sonora, Mexico. The resort at Peña Blanca Lake was closed in 1997, resulting in a decreased number of visitors in recent years compared to when the resort was operating. The nearby Calabasas Group Area offers camping and picnicking and is used several times a year (USFS 2002a).

Full access is provided to this area for low-clearance vehicles by the paved section of Ruby Road connecting to I-19. The remoteness of this area is limited by human activities such as other automobiles at the Peña Blanca Lake parking area and along Ruby Road. Social encounters, both on Ruby Road and at the developed lake area, are moderate to high on weekends, with encounters between multiple parties likely. Social encounters tend to decrease during the week. There are rustic facilities and evidence of site management, such as paved parking areas, picnic tables, and an electric distribution line that parallels Ruby Road east of Peña Blanca Lake. The existing naturalness of the lake area is moderate, rated per the ROS in terms of Scenic Integrity. Outside of the lake area, the existing naturalness or scenic integrity is high, as the landscape appears intact. Visitor management is slight but noticeable, with simple natural signs identifying locations such as Upper Thumb Picnic Area. Visitor impacts to the area consist of soil impacts from automobiles on roads and parking areas, and disturbances in vegetation due to footpaths.

Western Corridor Roaded Modified Area. West of Peña Blanca Lake, the area surrounding this unpaved portion of Ruby Road is classified as Roaded Modified. On the Coronado National Forest, Roaded Modified is similar to the Semi-Primitive Motorized setting, but with easier access (better roads). A large majority of visitors that go beyond Peña Blanca Lake travel on Ruby Road to destinations such as Sycamore Canyon, within the Pajarita Wilderness, and California Gulch. Activities in this area include sightseeing, birding, hiking, and rock climbing. Several smaller roads that intersect Ruby Road, such as Bear Valley Ranch Road, offer opportunities for all-terrain vehicle use. The Roaded Modified area also attracts a few herpetologists (people studying reptiles and amphibians) (USFS 2002a).

Ruby Road provides dirt road access to this Roaded Modified Area. Four-wheel drive vehicles are sometimes needed for travel on this road, depending on road and weather conditions, but generally the road does not limit access. This area is more remote than along Ruby Road east of Peña Blanca Lake, as the only evidence of human activity is the dirt road and occasional foot trails. Social encounters in this area are limited, with occasional encounters between parties likely to occur. The operations of U.S. Border Patrol agents in this area increase the likelihood of having at least a few social encounters during a visit. The only evidence of facilities or site management is the maintenance of Ruby Road. The naturalness of this area along Ruby Road is high, with human alterations limited to Ruby Road, several side roads, and foot trails. Limited road signs are the primary indication of visitor management, which is generally low in this area. Visitor impacts to the area consist of soil impacts from automobiles and all-terrain vehicles on roads, and occasional footpaths disturbing vegetation.

Western Corridor Semi-Primitive Motorized Area. Upon turning north from Ruby Road, the Western Corridor runs west of the Atascosa and Tumacacori Mountains through Semi-Primitive Motorized land to the northern boundary of the Tumacacori EMA. It also runs through Semi-Primitive Motorized land south and east of Ruby Road. Semi-Primitive Motorized settings are areas with primitive roads (that is, high clearance and four wheel drive) and trails. About 30 percent of the use of this area is by backcountry hunters. Hunting season is from August to February and includes deer, mountain lion, and quail hunting. Some all-terrain vehicles are used in this area, and the area is used daily by range permittees. The remaining recreational use includes hikers, horseback riders, and others who come to enjoy the scenery and find solitude (USFS 2002a). In addition, the U.S. Border Patrol conducts routine surveillance in this area, often accessing the ridgetops to get an open view of the area.

Access to this area is limited to roads assigned for use by high-clearance vehicles, on which traffic is normally minor, consisting of administrative, permitted, or dispersed recreation uses. This results in significantly lower visitor numbers than along Ruby Road (USFS 2002a). This area is more remote than along Ruby Road, as the only evidence of human activity are dirt roads and occasional foot trails. Social encounters in this area are very limited, with a high likelihood of not having any social encounters on some days. There is a decrease in U.S. Border Patrol activity as distance from the U.S.-Mexico border increases. The only evidence of facilities or site management is the maintenance of dirt roads and trails. The naturalness is very high, with human alterations limited to dirt roads and foot trails. Visitor management is very low in this area, limited to a few road signs. Visitor impacts to the area consist of soil impacts from automobiles and all-terrain vehicles on roads, and occasional footpaths disturbing vegetation.

Western Corridor Semi-Primitive Non-Motorized Area. The Western Corridor and/or its potential new access roads pass within 0.25 mi (0.40 km) of a Semi-Primitive Non-Motorized Area. Semi-Primitive Non-Motorized settings are areas without roads that people use for a wide variety of activities, but primarily for dispersed recreation uses. Access to this area is limited to trails, used occasionally by recreationalists such as hikers and hunters. This area is more remote than the Semi-Primitive Motorized areas, as the only evidence of human activity is occasional foot trails. Social encounters in this area are very limited, with a high likelihood of not having any social encounters on some days. U.S. Border Patrol activities in this area are likely to be reduced given the limited access. The only evidence of facilities or site management is the maintenance of trails. The naturalness is very high, with human alterations limited to trails. Visitor management is virtually non-existent, and visitor impacts to the area consist of soil impacts and vegetation disturbances from footpaths.

3.1.2.2 *Central Corridor*

The Central Corridor includes an estimated 15.1 mi (24.3 km) within the Coronado National Forest, as shown by the 0.25 mi (0.40 km)-wide study corridor in Figure 3.1–2. The Central Corridor crosses Semi-

Primitive Motorized land for an estimated 14 mi (23 km), and crosses Roaded Natural land for an estimated 1.1 mi (1.8 km) upon crossing Ruby Road and then runs through Semi-Primitive Motorized land to the Coronado National Forest boundary. The Central Corridor passes briefly within 0.25 mi (0.40 km) of a Semi-Primitive Non-Motorized Area north of Ruby Road. A number of roads leading onto the National Forest System lands east of the Tumacacori Mountains are used for recreation such as hiking, birding, photography, biking, horseback riding, and all-terrain vehicle use. Rock Corral Canyon Road, popular for biking, is crossed by the Central Corridor an estimated 1.0 mi (1.6 km) outside (east) of where the road enters the national forest. Beyond these roads, there is limited use of the national forest land east of the Tumacacori Mountains, especially compared to the use along Ruby Road and at Peña Blanca Lake farther to the south (USFS 2002a). For each ROS classified area, the current setting indicators and recreational uses along the Central Corridor are described below.

Central Corridor Roaded Natural Area. The Roaded Natural Area crossed by the Central Corridor is a 1.0 mi (1.6 km) strip of land at the crossing of Ruby Road. Full access is provided to this area for low-clearance vehicles by the paved section of Ruby Road leading from I-19, and by dirt access roads to the EPNG pipeline ROW. The remoteness of this area is limited by the automobiles on Ruby Road. Social encounters on Ruby Road are moderate to high, increasing on weekends, with encounters between multiple parties likely. The rustic facilities and evidence of site management are the Ruby Road and signs along the road, and an electrical distribution line on wooden poles paralleling Ruby Road. The existing naturalness is high, as the landscape appears intact. Visitor management is slight but noticeable, with simple natural signs identifying locations such as the national forest boundary. Visitor impacts to the area consist of soil impacts from automobiles on side roads, and disturbances in vegetation due to footpaths.

Central Corridor Semi-Primitive Motorized Areas. Access to the Semi-Primitive Motorized Area comprising most of the Central Corridor is limited to primitive roads assigned for use by high clearance and four wheel drive vehicles, on which traffic is normally minor, consisting of administrative, permitted, or dispersed recreation uses. Many of these roads also provide access to the existing EPNG pipeline ROW within the Central Corridor. The remoteness of this area is limited by the overlooking views of the Santa Cruz Valley and I-19 that is within 1.0 mi (1.6 km) of the Central Corridor where it enters the Coronado National Forest, and a maximum of approximately 5.0 mi (8.0 km) from the Central Corridor. Social encounters in this area are limited, with the likelihood of having a few social encounters increasing on the weekends. There is a decrease in U.S. Border Patrol activity as the distance from the U.S.-Mexico border increases. The only evidence of facilities or site management is the maintenance of dirt roads and trails. The naturalness is very high, with human alterations only apparent along the EPNG pipeline ROW, and limited dirt roads and foot trails. Visitor management is very low in this area, limited to a few signs. Visitor impacts to the area consist of soil impacts from automobiles and all-terrain vehicles on roads, and occasional footpaths disturbing vegetation.

Central Corridor Semi-Primitive Non-Motorized Area. The Central Corridor (Option 1) and/or its potential new access roads pass briefly within 0.25 mi (0.40 km) of a Semi-Primitive Non- Motorized Area. Option 2 passes through approximately 1.9 mi (3.1 km) of this area. Semi-Primitive Non-Motorized settings are areas without roads that people use for a wide variety of activities, but primarily for dispersed recreation uses. Access to this area is limited to trails, used occasionally by recreationalists such as hikers. This area is more remote than the Semi-Primitive Motorized areas, as the only evidence of human activity is occasional foot trails. Social encounters in this area are very limited, with a high likelihood of not having any social encounters on some days. U.S. Border Patrol activities in this area are reduced given the limited access. The only evidence of facilities or site management is the maintenance of trails. The naturalness is very high, with human alterations limited to trails. Visitor management is virtually non-existent, and visitor impacts to the area consist of soil impacts and vegetation disturbances from footpaths.

3.1.2.3 *Crossover Corridor*

The Crossover Corridor includes an estimated 29.7 mi (47.8 km) within the Coronado National Forest, as shown by the 0.25 mi (0.40 km)-wide study corridor in Figure 3.1–2. The Crossover Corridor crosses Semi-Primitive Motorized land for an estimated 25.2 mi (40.6 km) on the east and west sides of the Tumacacori Mountains and south and east of Ruby Road, Semi-Primitive Non-Motorized land for an estimated 3.3 mi (5.3 km) within Peck Canyon, and Roaded Natural land for an estimated 1.1 mi (1.8 km) upon crossing Ruby Road. On the west side of the Tumacacori Mountains (in the segment common with the Western Corridor), recreational use consists of backcountry hunters, hikers, horseback riders and others who come to enjoy the scenery and find solitude. The U.S. Border Patrol conducts routine surveillance in this area, often accessing the ridgetops to get an open view of the area. Within Peck Canyon, recreation is more limited, but offers a favorite setting for some hikers, birders, hunters, horseback riders, and all-terrain vehicle users (USFS 2002a). On the east side of the Tumacacori Mountains, a number of trails and roads (for high clearance and four wheel drive vehicles) offer recreation, as described above for the Central Corridor. For each ROS classified area, the current setting indicators and recreational uses along the Crossover Corridor are described below. The information in Section 3.1.2.2 regarding Options 1and 2 are applicable to the Crossover Corridor.

Crossover Corridor Roaded Natural Area. The Roaded Natural Area crossed by the Crossover Corridor is a 1.0 mi (1.6 km) strip of land at the crossing of Ruby Road. This segment is common with the Central Corridor Roaded Natural Area, and the ROS setting indicators are the same as previously described for this area.

Crossover Corridor Semi-Primitive Motorized Areas. Access to the Semi-Primitive Motorized Areas on the west and east sides of the Tumacacori Mountains is limited to primitive roads assigned for use by high clearance and four wheel drive vehicles, on which traffic is normally minor. Many of the roads on the east side of the Tumacacori Mountains also provide access to the existing EPNG pipeline ROW within the Crossover Corridor. The area west of the Tumacacori Mountains is very remote, given the distance to major roads such as Ruby Road and Arivaca Road. Sights and sounds of human activity are limited or non-existent. On the east side of the Tumacacori Mountains, the remoteness is limited by the overlooking views of the Santa Cruz Valley and I-19, as described for the Central Corridor. West of the Tumacacori Mountains, social encounters are very limited, with a high likelihood of not having any social encounters on some days, whereas social encounters would be more likely east of the Tumacacori Mountains. U.S. Border Patrol activities along the Crossover Corridor are limited given the distance from the U.S.-Mexico border. The only evidence of facilities or site management is the maintenance of dirt roads and trails. The naturalness is very high, with human alterations only apparent along the EPNG pipeline ROW. Visitor management is very low in this area, limited to a few signs. Visitor impacts to the area consist of soil impacts from automobiles and all-terrain vehicles on roads, and occasional footpaths disturbing vegetation.

Crossover Corridor Semi-Primitive Non-Motorized Area. The Crossover Corridor and its potential new access roads pass through Semi-Primitive Non-Motorized land in Peck Canyon. Within Peck Canyon, recreation is limited, but offers a favorite setting for some hikers, birders, hunters, horseback riders, and all-terrain vehicle users (USFS 2002a). Access to this area is on a trail that goes several miles into Peck Canyon from the east side. There are also remnants of a trail from a water pipe that used to supply water to the town of Ruby located several miles west of the proposed project. This area is more remote than the Semi-Primitive Motorized areas east of the Tumacacori Mountains, as the only evidence of human activity is occasional foot trails. Social encounters in this area are very limited, with a high likelihood of not having any social encounters on some days. U.S. Border Patrol activities in this area are likely to be reduced given the limited access and distance to the U.S.-Mexico border. The only evidence of facilities or site management is the maintenance of trails. The naturalness is very high, with human

alterations limited to trails. Visitor management is virtually non-existent, and visitor impacts to the area consist of soil impacts and vegetation disturbances from footpaths.

3.1.2.4 *115-kV Interconnection of the Gateway and Valencia Substations*

There are no state parks, national parks, or national monuments in the vicinity of the proposed interconnection project area. The nearest park/recreation area, Sergeant Manuel Tapia Recreational Trail, is located approximately 0.5 mi (0.8 km) north of the proposed interconnection.

3.2 VISUAL RESOURCES

This section discusses the existing visual resources in the vicinity of the proposed project. The discussion includes a description of the terminology and concepts used to characterize visual resources for the entire length of the proposed project, including Bureau of Land Management (BLM), Coronado National Forest, state, and private land. The terminology and concepts are consistent with the U.S. Department of Agriculture Forest Service (USFS) Scenery Management System (SMS) used by USFS for the inventory and analysis of aesthetic values of National Forest System lands, as outlined in *Landscape Aesthetics: A Handbook for Scenery Management* (USFS 1995).

It should be noted that the Coronado National Forest has recommended use of the SMS for visual analysis of the proposed project, rather than the former USFS Visual Resource Management System. In the early 1980s, the Coronado National Forest was mapped by USFS using the Visual Resource Management System, which included Visual Quality Objectives. In the early 1990s, the SMS was developed as a new system for managing scenic resources, including new terminology, different end products, increased public involvement, and mapping using Geographic Information Systems (GIS) technology. In 1994, the Deputy Chief of the USFS directed National Forests to use the SMS (Reynolds, 2380, August 22, 1994), and in 1996, the Chief directed the same (USFS 1995).

The SMS is more appropriate for the proposed project analysis because it takes into account increased public awareness and involvement in protecting scenic resources on National Forest System lands, and increased public use of the area, which has changed how the landscapes are viewed (e.g., the SMS considers viewsheds from trails). The Coronado National Forest has completed an inventory of its scenic resources using the SMS, and has developed new criteria for defining Scenic Attractiveness, a major component in mapping scenic resources. This information will be considered during the Forest Plan revision, and Scenic Integrity Objectives will be established through that process. Until then, the SMS inventory will be used for project-level analysis and design, such as the analysis that follows for the TEP Sahuarita-Nogales Transmission Line Project (USFS 2002b). However, this EIS also provides an assessment of impacts to visual resources using the Visual Quality Objectives (VQO) consistent with the *Coronado National Forest Plan*. Appendix I provides that information.

The SMS is a tool for integrating benefits, values, desires, and preferences regarding aesthetics and scenery for all levels of land management planning. The SMS recognizes that high-quality scenery, especially scenery with natural-appearing landscapes, enhances people's lives and benefits society. By establishing a terminology for managing scenery, USFS has developed a systematic approach for determining the relative value and importance of scenery that can be applied in concept for the entire proposed project. The visual resource attributes outlined by the SMS include the following:

- **Landscape Character** – a description of the overall visual and cultural impression of landscape attributes and the physical appearance and cultural context of a landscape that gives it an identity and "sense of place."

- **Scenic Attractiveness** – ratings based on the SMS scale of Distinctive (A), Typical or Common (B), and Undistinguished (C) that indicate the uniqueness of landscapes in the region or human perceptions of the intrinsic beauty of landform, rockform, waterform, and vegetation patterns.

- **Concern Levels and Landscape Visibility** – ratings based on the SMS scale for Concern Levels, indicating the degree of public importance placed on the landscape viewed from travelways and use areas, and the visibility of lands in each distance zone. Concern Levels are based on the number of visitors and the interest of visitors in the scenery, and distance zones are based on the distance from the viewer, defined as foreground within 0.5 mi (0.8 km), middleground between 0.5 mi (0.8 km) and 4 mi (6 km), and background beyond 4 mi (6 km) from the observer. The visibility of lands is affected

by the degree of discernible detail and perceptible visual range, or farthest distance a person can see without being clouded by haze, especially in the background distance zone. Perceptible visual range is attributable to the amount and size of particles in the air, depending on pollution levels, naturally occurring dust, and meteorological factors such as wind and humidity. Visibility is normally much better in dry climates, such as in southeastern Arizona, than in humid climates, although wind-suspended dust can significantly reduce visibility in drier periods. For further discussion of climate refer to Section 3.8, Air Quality.

- **Scenic Class** – a composite rating that indicates the relative importance of a landscape, based on the Scenic Attractiveness, Concern Level, and Landscape Visibility classifications of an area. Scenic Classes 1 and 2 have high public value, Classes 3 through 5 have moderate value, and Classes 6 and 7 have low value.

- **Scenic Integrity** – rating that indicates the degree of intactness and wholeness of the landscape character. Human alterations can lower, maintain, or raise Scenic Integrity. Scenic Integrity is rated as Very High, High, Moderate, Low, Very Low, or Unacceptably Low.

While the entire proposed project is described here in terminology and concepts consistent with the SMS, the quantitative rating and mapping of the visual attributes described above applies only to National Forest System land, and includes travelways both on and off the National Forest System land from which the proposed project may be viewed, such as I-19. The following sections describe the existing visual environment in the vicinity of the proposed project for each alternative, with separate sections addressing the National Forest System land. The Scenic Class ratings were originally determined by USFS on a Coronado National Forest-wide scale, then verified through field visits to the proposed project area.

3.2.1 Western Corridor

Coronado National Forest. The Western Corridor crosses an estimated 29.5 mi (47.5 km) of the Coronado National Forest, primarily through a landscape of undisturbed vegetation set in steep sloped canyons, foothills, and mountains. The Western Corridor passes south along the west side of the Tumacacori and Atascosa Mountains (passing through Bear Valley just north of the Pajarita Wilderness), then meets and runs along the south side of Ruby Road as it turns gradually east at the Pajarita Wilderness (see Figures 3.1–1 and 3.2–2). The Western Corridor separates from Ruby Road west of Castle Rock, continuing south of Ruby Road until the Western Corridor intersects the El Paso Natural Gas (EPNG) pipeline right-of-way (ROW) and the Central and Crossover Corridors. Upon rejoining, the three corridors continue together through a landscape of natural vegetation, following the EPNG pipeline ROW along the eastern foothills of the Atascosa and Pajarito Mountains to the Coronado National Forest boundary.

The proposed project is set within the Sky Island Landscape Character Type that encompasses southeastern Arizona and the entire Coronado National Forest. This region is characterized by strong contrasts of massive mountain ranges rising abruptly from arid desert floors, with areas of rugged foothills, cliffs, and canyons in between. “It is this mosaic of low deserts and high mountains that results in an incredible diversity of plants and animals and awesome scenery” (USFS 1999). Specifically within the Tumacacori Ecosystem Management Area (EMA) in the vicinity of the Western Corridor, the northern portion to the west of the Tumacacori Mountains is desert grasslands with sparse, short, well-spaced vegetation that is gray-green to blue-green in color, set in grasses that are typically golden brown, as shown in Figure 3.2–1. During the summer months after the monsoon rains, the grasses become bright green in color. As the Western Corridor turns gradually east near the Pajarita Wilderness and continues along Ruby Road, the project corridor includes an increasing number of oak trees (Broadleaf Woodland Evergreen vegetation type) and rocky outcrops. Castle Rock, a prominent rocky outcrop topographic

Figure 3.2–1. Typical Desert Grasslands Vegetation in the Coronado National Forest.

feature, is located in this area, to the southwest of Peña Blanca Lake. The area also includes numerous desert washes, mountain meadows, and canyon bottoms with riparian vegetation, green from seasonal water availability. The vegetation, topography, rock form, and water combine to create three categories of Scenic Attractiveness, as shown in Figure 3.2–2. This figure shows that the Western Corridor passes primarily through Distinctive (A) landscapes 21.2 mi (34.1 km), with 7.7 mi (12 km) of Typical or Common landscape (B), and 0.6 mi (1 km) of Undistinguished (C) landscape. Scenic Attractiveness and other visual attributes described in the following text are quantified for each proposed corridor in Table 3.2–1.

Table 3.2-1. Visual Attributes of the Western, Central, and Crossover Corridors On the Coronado National Forest

Corridor	Total length	Length on the CNF	Scenic Attractiveness			Scenic Classes (Public Value)			
			A Distinctive	B Typical	C Undistinguished	High		Moderate	
						1	2	3	4
Western (mi)	65.7	29.5	21.2	7.7	0.6	10.5	11.1	2.6	5.3
Central (mi)	57.1	15.1	5.4	9.6	0.1	1.8	13.3	-	-
Crossover (mi)	65.2	29.3	14.7	14.0	0.6	5.5	15.2	3.3	5.3

Source: USFS 2001b.

The degree of public importance placed on the landscape viewed from travelways and use areas is indicated by the Concern Levels defined in the SMS. Concern Level 1 roads and trails include primary travelways that receive a moderate to high amount of use by people that are likely to have high interest in the surrounding landscape. Figure 3.2–3 shows that the Concern Level 1 travelways in the vicinity of the Western Corridor are Ruby Road, I-19, and Arivaca Road. The Concern Level 2 areas near the Western Corridor shown on the map are secondary travelways and use areas that receive a moderate amount of use, including several roads off Ruby Road, Forest Road 684, and trails to Atascosa Lookout and into the Pajarita Wilderness. The shadings on the map represent a broad-brush definition of foreground and middleground distance zones from the Concern Level 1 and 2 travelways. Note that these broad-brush definitions of distance zones were used as the starting point for evaluating project visibility. The hilly terrain and canyons of the area provide wide-open views of the Western Corridor in some areas while blocking views of the Western Corridor in other areas. The Western Corridor would be most visible in the immediate foreground to travelers on Ruby Road in the area west of Peña Blanca Lake and northwest of the Pajarita Wilderness. The Western Corridor would be west of the Tumacacori and Atascosa Mountains and thus not visible in the national forest from I-19 until near Nogales.

Based on Scenic Attractiveness, Concern Levels, and distance zones, USFS has determined Scenic Class ratings for the Coronado National Forest. Scenic Class indicates the relative importance of landscapes when comparing the value of scenery to other resources. Scenic Classes 1 and 2 have high public value, Classes 3 to 5 have moderate value, and Classes 6 and 7 have low value. Figure 3.2–4 shows the Scenic Class ratings of the Coronado National Forest Tumacacori EMA. The figure shows that the Tumacacori EMA is predominantly Classes 1 and 2, with portions of Classes 3 and 4. The Western Corridor passes through 10.5 mi (16.9 km) of Class 1, 11.1 mi (17.9 km) of Class 2, 2.6 mi (4.2 km) of Class 3, and 5.3 mi (8.5 km) of Class 4.

The human alterations to the natural landscape are minimal along the Western Corridor within the Coronado National Forest, as shown by the map of existing Scenic Integrity in Figure 3.2–5. Especially to the south and west of the Tumacacori and Atascosa Mountains, the landscape is pristine as far as the eye can see, resulting in very high Scenic Integrity (the landscape is intact). For a 1-mi (1.6-km) strip of land following Ruby Road through the Tumacacori EMA, the Scenic Integrity is high (appears to be intact). Although Ruby Road is a human alteration, because it provides visitor access and provides viewing platforms for the public, it is generally considered a fairly neutral element in the landscape (that is, it has a minimal impact on Scenic Integrity). Peña Blanca Lake Recreation Area, which includes visitor facilities, and the town of Ruby, approximately 3 mi (4.8 km) west of the proposed project, both have moderate Scenic Integrity (appears slightly altered). Subtle alterations to the area landscape include roads and trails off Ruby Road, and an electric distribution line on wooden poles near Peña Blanca Lake.

Outside the Coronado National Forest. Approximately 36.2 mi (58.3 km) of the Western Corridor (out of a total of 65.7 mi [106 km]) is outside of the Coronado National Forest. The landscape of this portion of the Western Corridor is characterized primarily by desert grassland set in scattered foothills, as depicted in Figure 3.2–1. Upon leaving the existing South Substation and crossing I-19, the Western Corridor passes a low-density residential area, and upon exiting Sahuarita passes several commercial properties. There are multiple mine tailings piles that dominate the landscape in this area. This section of the Western Corridor follows existing TEP transmission lines including a 345-kV and 138-kV line on BLM lands, and meets up with an EPNG pipeline ROW that passes by the existing TEP Cyprus Sierrita Substation, as depicted in Figure 3.2–6 showing existing utilities.

The Western Corridor separates from the Central Corridor and EPNG pipeline ROW at an estimated 3 mi (5 km) south of the Cyprus Sierrita Substation, turning to the southwest through desertscrub vegetation and crossing into the Coronado National Forest. The human alterations to the natural landscape such as utilities, multiple expansive mine tailings piles, and buildings in the northern portion of the Western Corridor reduce the Scenic Integrity of the landscape to Moderate to Low (the visual landscape appears slightly to moderately altered, and the mine tailings piles dominate some areas of the landscape). The Scenic Integrity of the BLM land is Moderate to Low given the two existing transmission lines. Upon separating from the Central Corridor, the Scenic Integrity increases to High (the landscape begins to appear unaltered). As the Western Corridor crosses I-19 and passes roads and residences, the proposed project would be visible to residents, travelers, and recreationalists in the foreground and middleground distance zones, until it is hidden behind mine tailings piles. Upon separating from the Central Corridor, the Western Corridor would be almost entirely obscured from view from I-19 by mine tailings piles and natural foothills. The town of Arivaca is approximately 10.5 mi (17 km) west of the Western Corridor.

Upon exiting the Coronado National Forest to the southeast, the three proposed corridors run together through a landscape of undeveloped land with natural vegetation, following the EPNG pipeline ROW. The corridors go along the eastern foothills of the Atascosa and Pajarita Mountains and into the edge of the City of Nogales and the proposed Gateway Substation. The corridors then continue south to the Mexico border through an area of industrial and limited residential development.

3.2.2 Central Corridor

Coronado National Forest. The Central Corridor crosses an estimated 15.1 mi (24.3 km) of the Coronado National Forest, all of which is within or near an existing Forest Transportation Systems and Utilities Corridor containing a buried EPNG pipeline within a 50 ft (15 m) ROW. The Central Corridor runs south along the east side of the Tumacacori Mountains and Atascosa Mountains, then turns southeast, crosses Ruby Road, and intersects the Western Corridor. Upon rejoining, the three corridors continue together through a landscape of natural vegetation, following the pipeline ROW along the eastern foothills of the Atascosa and Pajarito Mountains to the Coronado National Forest boundary.

The proposed project is set within the Sky Island Landscape Character Type, as described above for the Western Corridor. Within the Tumacacori EMA, the Central Corridor passes through desert grasslands with sparse, short, well-spaced vegetation that is gray-green to blue-green in color, set in golden brown grasses. Vegetation within the EPNG pipeline ROW and access roads leading to the ROW is cleared, as shown in Figure 3.2–7. The area also includes some rocky outcrops, desert washes, and canyon bottoms with riparian vegetation, green from seasonal water availability. The vegetation, topography, rock form, and water combine to create three categories of Scenic Attractiveness, as shown in Figure 3.2–2. This figure shows that the Central Corridor passes primarily through Typical or Common (B) landscape (9.6 mi [15.4 km]), with 5.4 mi (8.7 km) passing through Distinctive (A) landscape, and 0.1 mi (0.2 km) passing through Undistinguished (C) landscape.

The degree of public importance placed on the landscape viewed from travelways and use areas is indicated by the Concern Levels defined in the SMS. Concern Level 1 roads and trails include primary travelways that receive a moderate to high amount of use by people that are likely to have high interest in the surrounding landscape. Figure 3.2–3 shows that the Concern Level 1 travelways in the vicinity of the Central Corridor are Ruby Road and I-19. The Concern Level 2 areas near the Central Corridor shown on the map are secondary travelways on the east side of the Atascosa Mountains that receive a moderate amount of use, such as Rock Corral Canyon Road. San Cayetano Elementary School at Peck Canyon Road and I-19 is also a Concern Level 2 area. The shadings on the map represent a broad-brush definition of foreground and middleground distance zones from the Concern Level 1 and 2 travelways. Note that these broad-brush definitions of distance zones were used as the starting point for evaluating project

visibility; refined project maps showing actual project visibility based on screening created by the area's terrain and vegetation are included in Section 4.2, Visual Impacts.

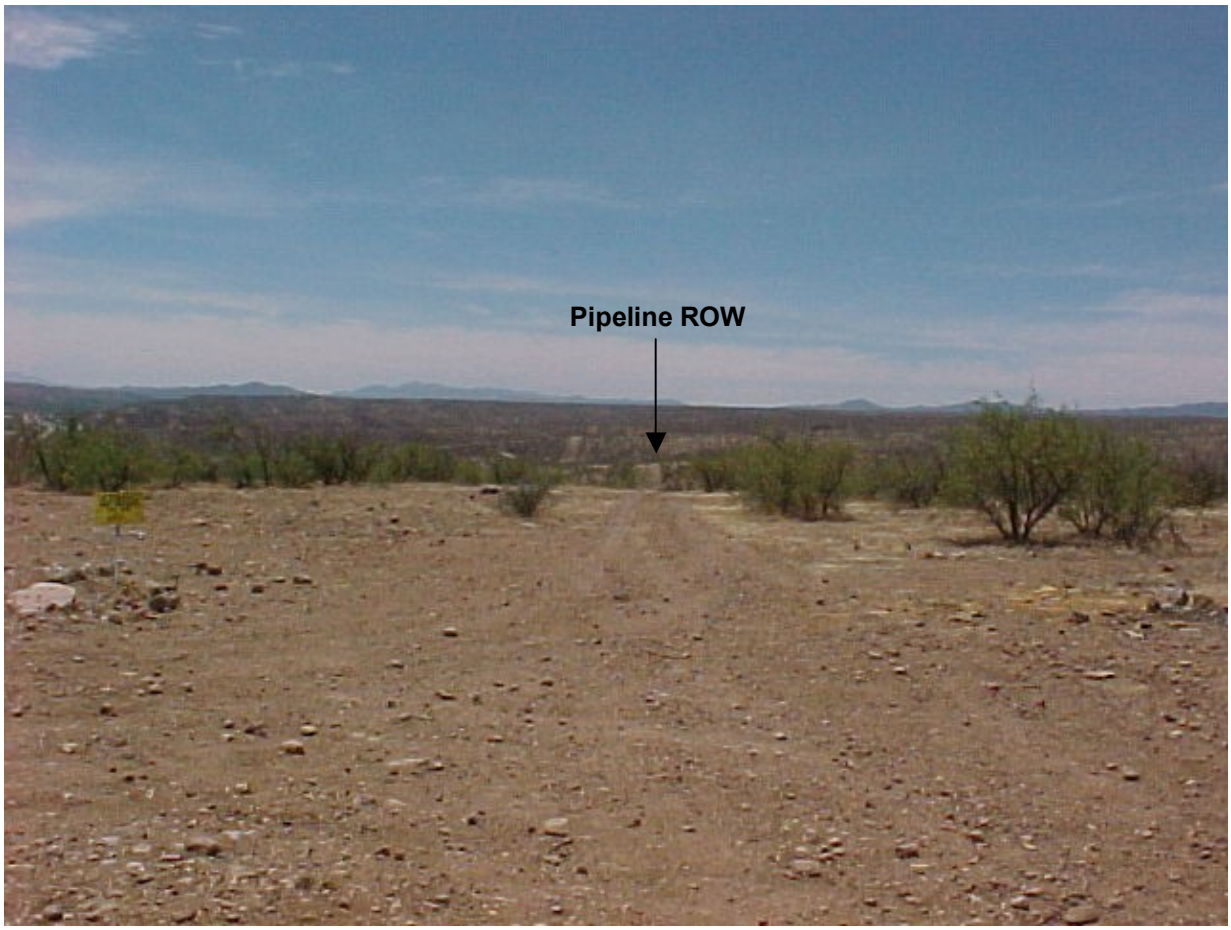

Figure 3.2–7. El Paso Natural Gas Pipeline ROW.

The elevated landforms that run directly along the west side of I-19 block views of the Central Corridor from most of I-19 as the Central Corridor approaches and traverses the Coronado National Forest. A number of Concern Level 2 travelways in the area enter the foothills and provide more open vantage points of the Central Corridor, with segments of the Central Corridor evident in foreground, middleground, and background where it crosses the tops of ridges and foothills. As shown in Figure 3.2–4, the Central Corridor is in the foreground as it crosses Ruby Road. The Central Corridor is not visible from Peña Blanca Lake Recreation Area.

Based on Scenic Attractiveness, Concern Levels, and Distance Zones, USFS has determined Scenic Class ratings for the Coronado National Forest, as described above for the Western Corridor. The Central Corridor passes through 1.8 mi (2.9 km) of Class 1 and 13.3 mi (21.4 km) of Class 2.

Figure 3.2–5 is a map of existing Scenic Integrity within the Tumacacori EMA. The human alterations to the natural landscape along the Central Corridor within the Coronado National Forest are the linear disturbances of the EPNG pipeline ROW and access and recreational roads. The Scenic Integrity along the Central Corridor within the Tumacacori EMA is very high, except for a 1-mi (1.6-km) strip of land crossing Ruby Road where the Scenic Integrity is high. Peña Blanca Lake Recreation Area, which

includes visitor facilities, and the town of Ruby west of the proposed project, both have moderate Scenic Integrity.

Outside of the Coronado National Forest. Approximately 42 mi (68 km) of the Central Corridor (out of a total of 57.1 mi [91.9 km]) is outside of the Coronado National Forest. The landscape of this portion of the Central Corridor is characterized primarily by desert grassland set in scattered foothills, as depicted in Figure 3.2–1. Upon leaving the existing South Substation and crossing I-19, the Central Corridor passes a low-density residential area and several commercial properties. There are multiple mine tailings piles that dominate the landscape in this area. This section of the Central Corridor follows existing TEP transmission lines, including a 345-kV and 138-kV BLM land, and meets up with an EPNG pipeline ROW that passes by the existing TEP Cyprus Sierrita Substation, as depicted in Figure 3.2–6 showing existing utilities.

The Central Corridor separates from the Western Corridor at approximately 3 mi (4.8 km) south of the Cyprus Sierrita Substation, continuing to follow the pipeline ROW south through primarily undeveloped land. The Central Corridor approaches to within approximately 1.0 mi (1.6 km) of I-19 near Amado, Tubac, and Tumacacori, passing adjacent to areas of low-density residential development. The Central Corridor passes within 0.25 mi (0.40 km) of several Tubac residences. The Central Corridor continues south until it enters the Coronado National Forest south of Tumacacori.

Given the human alterations to the natural landscape such as utilities, multiple very large mine tailings piles, and buildings in the northern portion of the Central Corridor, the existing Scenic Integrity of the landscape is Moderate to Low (the visual landscape appears slightly to moderately altered, and the mine tailings piles dominate some areas of the landscape). The Scenic Integrity of the BLM land is Moderate to Low, given the two existing transmission lines. Upon separating from the Western Corridor, the Scenic Integrity is Moderate as the landscape appears slightly altered due to residences, commercial establishments, and roads in the area connecting with I-19. In Sahuarita, the Central Corridor would be visible to residents, travelers, and recreationalists in the foreground and middleground distance zones, until it is hidden behind mine tailings piles. Upon separating from the Western Corridor, the Central Corridor would be intermittently visible and blocked by the elevated terrain that runs directly along the west side of I-19. The Central Corridor would be visible from a number of residences in Amado, Tubac, and Tumacacori, especially those on the west side of I-19.

Upon exiting the Coronado National Forest to the southeast, the three proposed corridors run together through a landscape of undeveloped land with natural vegetation, following the EPNG pipeline ROW. The corridors follow the eastern foothills of the Atascosa and Pajarita Mountains and into the edge of the City of Nogales and the proposed Gateway Substation. The corridors then continue south to the Mexico border through an area of industrial and limited residential development.

3.2.3 Crossover Corridor

Coronado National Forest. The Crossover Corridor crosses an estimated 29.3 mi (47.2 km) of the Coronado National Forest, part of which is within or near an existing Forest Transportation Systems and Utilities Corridor containing a buried EPNG pipeline within a 50-ft (15-m) ROW. The Crossover Corridor is the same as the Western Corridor upon entering the Coronado National Forest from the north, running along the west side of the Tumacacori Mountains. The Crossover Corridor then turns to the east, goes approximately 7 mi (11 km) through Peck Canyon, and joins the Central Corridor on the east side of the Tumacacori Mountains. The Crossover Corridor continues south along the east side of the Atascosa Mountains, then turns to the southeast, crosses Ruby Road, and intersects the Western Corridor. Upon rejoining, the three corridors continue together through a landscape of natural vegetation, following the

EPNG pipeline ROW along the eastern foothills of the Atascosa and Pajarito Mountains to the Coronado National Forest boundary.

The proposed project is set within the Sky Island Landscape Character Type, as described for the Western Corridor. Within the Tumacacori EMA, the northern portion of the Crossover Corridor west of the Tumacacori Mountains passes through desert grasslands with sparse, short, well-spaced vegetation that is gray-green to blue-green in color, set in golden brown grasses. Figure 3.2–1 shows typical desert grassland vegetation. As the Crossover Corridor approaches Peck Canyon, the project corridor includes an increasing number of oak trees (Broadleaf Woodland Evergreen vegetation type) and rocky outcrops. Within Peck Canyon there are many areas with riparian vegetation, green from seasonal water availability. The vegetation, topography, rock form, and water combine to create three categories of Scenic Attractiveness, as shown in Figure 3.2–2. This figure shows that the Crossover Corridor passes primarily through Distinctive (A) landscape (14.7 mi [23.7 km]), with 14.0 mi (22.5 km) passing through Typical or Common landscape (B), and 0.6 mi (1 km) passing through Undistinguished (C) landscape.

The degree of public importance placed on the landscape viewed from travelways and use areas is indicated by the Concern Levels defined in the SMS. Concern Level 1 roads and trails include primary travelways that receive a moderate to high amount of use by people that are likely to have high interest in the surrounding landscape. Figure 3.2–3 shows that the Concern Level 1 travelways in the vicinity of the Crossover Corridor are Ruby Road, I-19, and Arivaca Road. The Concern Level 2 areas near the Crossover Corridor shown on the map are secondary travelways and use areas that receive a moderate amount of use, such as Rock Corral Canyon Road and roads on the east side of the Atascosa Mountains. San Cayetano Elementary School at Peck Canyon and I-19 is also a Concern Level 2 area. The shadings on the map represent a broad-brush definition of foreground and middleground distance zones from the Concern Level 1 and 2 travelways. The elevated landforms that run directly along the west side of I-19 block views of the Crossover Corridor from most of I-19 on the National Forest System lands. A number of Concern Level 2 travelways in the area enter the foothills and provide more open vantage points of the Crossover Corridor south of Peck Canyon, with segments of the Crossover Corridor evident in foreground, middleground, and background where it crosses the tops of ridges and foothills. The Crossover Corridor is in the foreground as it crosses Ruby Road. The Crossover Corridor is not visible from Peña Blanca Lake Recreation Area.

Based on Scenic Attractiveness, Concern Levels, and Distance Zones, the USFS has determined Scenic Class ratings for the Coronado National Forest, as described above for the Western Corridor. As shown in Figure 3.2–4, the Crossover Corridor passes through 5.6 mi (9.0 km) of Class 1, 15.3 mi (24.6 km) of Class 2, 3.4 mi (5.5 km) of Class 3, and 5.4 mi (8.7 km) of Class 4.

Figure 3.2–5 is a map of existing Scenic Integrity within the Tumacacori EMA. The human alterations to the natural landscape along the Crossover Corridor within the Coronado National Forest are the linear disturbances of the EPNG pipeline ROW and access and recreational roads. The Scenic Integrity along the Crossover Corridor within the Tumacacori EMA is very high, except for a 1-mi (1.6-km) strip of land crossing Ruby Road where the Scenic Integrity is High. Peña Blanca Lake Recreation Area, which includes visitor facilities, and the town of Ruby west of the proposed project, both have moderate Scenic Integrity.

Outside of the Coronado National Forest. An estimated 35.9 mi (57.7 km) of the Crossover Corridor is outside of the Coronado National Forest. The Crossover Corridor outside of national forest land is identical to the Western Corridor, and thus the affected environment is identical to the Western Corridor in this overlapping segment, as described in Section 3.2.1.

3.2.4 115-kV Interconnection of the Gateway and Valencia Substations

The topographic character within and surrounding the study area can be characterized as scattered foothills with desertscrub vegetation. The visual character in the vicinity of the project area includes a mix of residential, commercial, and industrial development. Permanent modification to the viewshed in the vicinity of the project area include SR 189, I-19, an existing 115-kV transmission line, numerous overhead distribution lines, and numerous commercial and industrial land uses with highly visible signs.

3.3 BIOLOGICAL RESOURCES

This section discusses the existing biological resources in the vicinity of the proposed project alternatives on lands administered by the Forest Service (USFS) and Bureau of Land Management (BLM), Arizona State Trust Lands, and private lands. Biodiversity, vegetation communities, wildlife, species afforded protection under the *Endangered Species Act* (ESA) of 1973, as amended, migratory birds, USFS Management Indicator Species (MIS), USFS and BLM sensitive species, Wildlife of Special Concern in Arizona, Arizona Department of Agriculture listed Plants, and invasive species are addressed. The discussions of the Central and Crossover Corridors are based on investigations that included the Option 1 sub-route. Because the sub-routes are near one another and both cross Semidesert Grassland, vegetation and wildlife, biodiversity, and special status species would be the same for both options. Option 2 would be expected to have more habitat disturbance and fragmentation than Option 1, however, because of the presence of the existing gasline in the Option 2 sub-route.

3.3.1 Biodiversity

All of the proposed transmission line corridors cross a portion of an area known as the Sky Island Region, which includes portions of southern Arizona and New Mexico and northern Mexico. The term "sky island"[1] is used to describe isolated mountain ranges that are separated by grasslands or desert, which to varying degrees, are barriers to the movement of species found at higher elevations. This region is at the point of convergence of the tropical, subtropical, and temperate climatic zones. As a result, many plant and animal species' ranges overlap in this region resulting in a relatively high degree of biodiversity.

Other important local features that influence biodiversity in the region include topographic relief and geology. Precipitation increases and temperature decreases with elevation creating vertical range of habitat for various species. According to the Wildlands Project (Wildlands Project 2000), "Species with broadly similar climatic preferences or tolerances tend to sort themselves along the elevational gradient where the blend of temperature and aridity (and other factors) best supports them. This results in a stacking or layering of biotic communities varying with latitude, size, and elevation of each range."

Although numerous species in the region are considered "rare," many are at the limits of their normal range and may be more common elsewhere in the United States or Mexico. These species may or may not have been identified by the U.S. Fish and Wildlife Service (USFWS), USFS, Arizona Game and Fish Department (AGFD), or the Arizona Department of Agriculture (ADA) as requiring legal protection or requiring special management practices to prevent listing under the ESA. Plant and animal species listed for special protection or management considerations by USFWS, USFS, BLM, AGFD, and ADA are provided in Section 3.3.3, Special Status Species. Refer to Section 3.1.1 for discussion of the Chiltipene Botanical Area within the northeastern portion of the Tumacacori Ecosystem Management Area (EMA) established by USFS as an in-situ botanical reserve. It is not possible to quantitatively distinguish the levels of biodiversity in the three corridors because no studies have been completed. Therefore, a qualitative assessment has been made.

The Tumacacori EMA, as shown in Figure 3.1–1, is part of the Coronado National Forest located in southeastern Arizona and bordered to the south by Mexico. It encompasses 203,800 acres (82,475 ha) and ranges in elevation from 3,200 to 6,200 ft (975 to 1,890 m). It is an ecologically rich area with nine

[1] The term "sky island" was coined by Weldon Heald in 1967 based on his observations of the Chiricahua Mountains (Warshall 1994).

distinctive vegetative community types, numerous deciduous and coniferous watersheds, and a variety of special interest plant and animal species.

3.3.1.1 *Western, Central, Crossover Corridors and 115-kV Itnerconnection*

Biodiversity is expected to be highest in the Crossover Corridor due to diverse terrain and vegetation, relatively few disturbances, and presence of water in portions of Peck Canyon (see Section 3.1, Figure 3.1–1). Biodiversity is expected to be high in the Western Corridor because this corridor crosses the Atascosa Mountains at a higher elevation than the Central Corridor. Biodiversity within the Central Corridor is still considered to be high due to its proximity to the Atascosa Mountains. The 115-kV interconnection between the Gateway and Valencia Substations would have the lowest biodiversity because of prior development in the area.

3.3.2 Vegetation and Wildlife

In January 2001, Harris Environmental Group completed a preliminary Biological Evaluation (BE) of the proposed corridors (HEG 2001). This preliminary BE was prepared for all three corridors and described the major vegetation communities, or biomes (Figure 3.3–1), and identified special status species (see Section 3.3.3, Special Status Species, for further discussion) that may potentially occur. Special status species were subsequently evaluated in greater detail in four Biological Assessments (HEG 2004a, 2004b, 2004c, 2004d) that are included as Appendices D, E, F, and K of this Environmental Impact Statement (EIS).

Wildlife surveys were conducted in the corridors for special status species as part of the preparation of the Biological Assessments in support of the proposed project.

According to Harris Environmental Group, all three corridors cross the following four distinct biotic communities (Figure 3.3–1) or biomes as defined by Brown (Brown 1994): (1) Sonoran Desertscrub, (2) Semidesert Grassland, (3) Madrean Evergreen Woodland, and (4) Sonoran Riparian Deciduous Forest. No wetlands were found in the proposed project corridors during field surveys conducted by Harris Environmental Group and none have been identified by USFS (USFS 2003). However, wetland vegetation may be present in portions of all corridors in small areas associated with perennial water or cattle tanks (manmade earthen dams in washes). Topography in the northern portion of the proposed corridors is relatively flat throughout the low-lying desert valleys with small rises from hills and dips from ephemeral (short-lived) washes. The elevation begins to rise in the southern portion of the proposed corridors in the Tumacacori EMA.

Arizona Upland/Sonoran Desertscrub. This biome occurs in the northern portion of all of the corridors. Vegetation typically includes saguaro (*Carnegiea gigantean*), cholla and prickly pear (*Opuntia* spp. [multiple species]) cacti, ocotillo (*Fouquieria splendens*), mesquite (*Prosopis* spp.), acacia (*Acacia* spp.) and paloverde (*Cercidium* spp.) trees. Associated shrubs within this biome include creosote bush *(Larrea tridentata),* triangle-leaf bursage (*Ambrosia deltoidea*), and brittlebush (*Encelia farinosa*) (HEG 2004a, 20034, 2004c).

Semidesert Grassland. This biome occurs in the central portions of the corridors. This biome is typically dominated by grama grass (*Bouteloua* spp.), lovegrass (*Eragrostis* spp.), and three-awn grass (*Aristida* spp.). Codominant plant species (sharing in the controlling influence of a biotic community) include low-stature mesquite (*Prosopis* spp.) and acacia (*Acacia* spp.) trees, agave (*Agave* spp.) and yucca (*Yucca* spp.) (HEG 2004a, 2004b, 2004c).

Madrean Evergreen Woodland. This biome occurs at the upper elevations of the corridors above 3,500 ft (1,066 m) above mean sea level. Representative plants within the corridors included Mexican blue oak (*Quercus oblongifolia*) and emory oak (*Q. emoryi*) trees, side-oats grama (*Bouteloua curtipendula*) and fluff grass (*Erioneuron pulchelum*) (HEG 2004a, 2004b, 2004c).

Sonoran Riparian Deciduous Forest. This biome is located along larger washes and drainage ways such as Sopori Wash and Peck Canyon. Higher water tables in these areas typical support large stands of cottonwood (*Populus fremonti*) and willow (*Salix* spp.) trees with canopy layers greater than 50 ft (15 m) in height (HEG 2004a, 2004b, 2004c).

The area of the above vegetation types occurring in each corridor was determined using Geographic Information Systems (GIS) software (ArcInfo) to map the corridors on the Arizona Gap Analysis Vegetation Study map (1999). The length of the corridor in each biome, as calculated by ArcInfo, was multiplied by the proposed corridor width (0.25 mi [0.4 km]). The resolution of this map is adequate for analysis of areas up to approximately 98 ft (30 m). This resolution is considered sufficient for large areas such as those portions of the corridors occurring in Sonoran Desertscrub, Semidesert Grassland, and Madrean Evergreen Woodland. However, this resolution is not sufficient to adequately map small areas such as those where Sonoran Riparian Deciduous Forest occurs. Therefore, Sonoran Riparian Deciduous Forest was identified on aerial photography and the amount of this habitat present in each corridor was estimated. Harris Environmental Group confirmed these estimations by visiting areas containing Sonoran Riparian Deciduous Forest. The acreage of each vegetation type, by corridor, is provided in the following discussion.

USFS Classified Riparian. This classification system was developed by USFS and *only* applies to riparian areas administered by USFS. Riparian areas outside lands administered by USFS are discussed above. USFS has rated riparian areas as "satisfactory" or "unsatisfactory" depending on three primary factors: (1) the percent of woody plant composition present, (2) age classes, and (3) natural shrub and tree crown cover. Watersheds rated as "unsatisfactory" in the Forest Plan (USFS 1986) are given priority for watershed improvement projects.

The USFS Classified Riparian category uses vegetation classes different from those used by Harris Environmental Group. The acreage of this vegetation in each corridor was based on GIS data provided by USFS. Although "Classified Riparian" includes "Deciduous Riparian," these areas were not mapped by Harris Environmental Group; therefore, these areas were not counted more than once.

Wildlife. Wildlife surveys were conducted in the corridors only for special status species. However, diversity and densities of wildlife in all of the corridors are expected to be typical of the Sky Island region (see discussion in Section 3.3.1). Large mammals, such as mule deer, javelina, black bear, mountain lion (cougar), coyote and kit fox can be expected to occur, as well as several species of small mammals such as ground squirrel, desert cottontail, black-tailed jackrabbit, and kangaroo rat. Amphibian and reptile species expected to occur include a variety of snake, lizard, toad, and frog species. Similarly, a wide variety of birds are expected throughout all of the corridors.

Habitat Fragmentation. Habitat fragmentation of varying degrees is present within all three corridors. Habitat fragmentation is considered to be the division of large, contiguous areas of habitat into smaller patches isolated from one another. Results of studies on habitat fragmentation can be difficult to interpret because of issues of scale (patch size vs. landscape). Most studies "measure fragmentation in ways that do not distinguish between habitat loss and habitat fragmentation per se, i.e., the breaking apart of habitat after controlling for habitat loss" (Farhig 2003). Fragmentation may result from human disturbances (e.g., land development) or natural events (e.g., forest fires).

3.3.2.1 *Western Corridor*

Table 3.3–1 lists the approximate acreage of each vegetation community present in the Western Corridor.

USFS Classified Riparian. On lands administered by USFS in the Western Corridor, approximately 0.8 acres (0.3 ha) of deciduous riparian, 1.1 acres (0.4 ha) of evergreen riparian, and 0.3 acres (0.1 ha) of dry desert riparian have been mapped (Table 3.3–2). Note that the "evergreen riparian" is unique to the USFS classification system in the context of this EIS. Furthermore, this vegetation type is not found outside National Forest System lands in any of the alternatives, and therefore, not analyzed for other land administration or ownerships.

Table 3.3–1. Biotic Communities Present in the Western Corridor

Vegetation Type	Entire Corridor (acres)	Coronado National Forest (acres)	Lands Administered by the BLM (acres)	All Other Land Ownership (acres)
AZ Upland/Sonoran Desertscrub	548	0	0	548
Semidesert Grassland	7,350	2,640	82	4,628
Madrean Evergreen Woodland	2,070	2,070	0	0
Sonoran Riparian Deciduous Forest	0.9	0.8	0	<0.1
Disturbed (agriculture, urban, or unvegetated)	634	0	0	634
USFS Classified Riparian	2	2	NA	NA
TOTAL	10,605	4,713	82	5,810

NA = not applicable.

Table 3.3–2. USFS Classified Riparian Areas in the Western Corridor

Vegetation Type	Area (acres)	Area Name	Condition[a]
Deciduous Riparian	0.2	East Fork Apache	Unsatisfactory
Deciduous Riparian	0.3	Sycamore	Satisfactory
Deciduous Riparian	0.3	Peña Blanca	Satisfactory
Evergreen Riparian	1.0	Peña Blanca	Satisfactory
Evergreen Riparian	0.1	Alamo	Unsatisfactory
Dry Desert Riparian	0.3	Alamo	Unsatisfactory

[a] Note that these ratings may be biased so that dry desert riparian vegetation types are more likely to be rated as unsatisfactory due to infrequent water flows.

3.3.2.2 *Central Corridor*

Table 3.3–3 lists the approximate acreage of each vegetation community present in the Central Corridor.

Table 3.3–3. Biotic Communities Present in the Central Corridor

Vegetation Type	Entire Corridor (acres)	Coronado National Forest (acres)	Lands Administered by the BLM (acres)	All Other Land Ownership (acres)
AZ Upland/Sonoran Desertscrub	548	0	0	548
Semidesert Grassland	7,634	2,226	82	5,326
Madrean Evergreen Woodland	180	180	0	0
Sonoran Riparian Deciduous Forest	4.4	4.4	0	<0.1
Disturbed (agriculture, urban, or unvegetated)	748	0	0	748
USFS Classified Riparian	4	4	NA	NA
TOTAL	9,118	2,414	82	6,622

NA = not applicable.

USFS Classified Riparian. On lands administered by USFS in the Central Corridor, approximately 0.9 acres (0.4 ha) of deciduous riparian, 0.9 acres (0.4 ha) of evergreen riparian, and 2.2 acres (0.9 ha) of dry desert riparian have been mapped (Table 3.3–4).

Table 3.3–4. USFS Classified Riparian Areas in the Central Corridor

Vegetation Type	Area (acres)	Area Name	Condition
Deciduous Riparian	0.1	Rock Corral	Unsatisfactory
Deciduous Riparian	0.8	Agua Fria	Satisfactory
Evergreen Riparian	0.9	Peck	Satisfactory
Dry Desert Riparian	1.3	Negro	Not rated
Dry Desert Riparian	0.6	Tinaja	Not rated
Dry Desert Riparian	0.3	Lost Dog	Not rated

3.3.2.3 *Crossover Corridor*

Table 3.3–5 lists the approximate acreage of each vegetation community present in the Crossover Corridor.

Table 3.3–5. Biotic Communities Present in the Crossover Corridor

Vegetation Type	Entire Corridor (acres)	Coronado National Forest (acres)	Lands Administered by the BLM (acres)	All Other Land Ownership (acres)
AZ Upland/Sonoran Desertscrub	548	0	0	548
Semidesert Grassland	8,847	4,136	82	4,629
Madrean Evergreen Woodland	572	572	0	0
Sonoran Riparian Deciduous Forest	4.4	4.4	0	<0.1
Disturbed (agriculture, urban, or unvegetated)	634	0	0	634
USFS Classified Riparian	48	48	NA	NA
TOTAL	10,653	4,760	82	5,811

NA = not applicable.

USFS Classified Riparian. On lands administered by USFS in the Crossover Corridor, approximately 1.3 acres (0.5 ha) of deciduous riparian, 13.3 acres (5.4 ha) of evergreen riparian, and 33.6 acres (13.5 ha) of dry desert riparian have been mapped (Table 3.3–6).

Table 3.3–6. USFS Classified Riparian Areas in the Crossover Corridor

Vegetation Type	Area (acres)	Area Name	Condition
Deciduous Riparian	1.3	East Fork Apache	Unsatisfactory
Evergreen Riparian	13.3	Peck	Satisfactory
Dry Desert Riparian	19.3	Negro	Not rated
Dry Desert Riparian	9.5	Tinaja	Not rated
Dry Desert Riparian	4.8	Lost Dog	Not rated

3.3.2.4 *115-kV Interconnection of the Gateway to Valencia Substations*

The vegetation character of the undeveloped portion of the study area is typical of a semi-desert grassland community. It is characterized by shrubby mesquite and desert broom. Shrub species include acacia and velvet-pod mimosa. Along marginal riparian areas, desert willow and scrubby mesquite are common. Semidesert grassland is present on the east side of I-19 along the proposed interconnection route, except for a short distance of urban development immediately west of the Valencia Substation. West of I-19, semidesert grassland is present on most of the proposed route, except for an urbanized area of warehouses and parking lots west of Mariposa Road. Vegetation in the semidesert grassland is dominated by velvet mesquite (*Prosopis velutina*), white-thorn acacia (*Acacia constricta*), catclaw acacia (*Acacia greggii*), and a variety of grass species.

Some of the mammal species that might be common in this habitat include eastern cottontail (*Sylvilagus floridanus*), rock squirrel (*Spermophilus variegates*), white-throated woodrat (*Neotoma albigula*), and coyote (*Canis latrans*). Common bird species in this area could include red-tailed hawk (*Buteo jamaicensis*), mourning dove (*Zenaida macroura*), western kingbird (*Tyrannus verticalis*), Chihuahuan raven (*Corvus cryptoleucus*), and house finch (*Carpodacus mexicanus*). Amphibians and reptiles that could occur in this habitat include red-spotted toad (*Bufo punctatus*), eastern fence lizard (*Sceloporus undulates*), side-blotched lizard (*Uta stansburiana*), western whiptail (*Cnemidophorus tigris*), gopher snake (*Pituophis melanoleucus*), and western diamondback rattlesnake (*Crotalus atrox*).

3.3.3 Special Status Species

Special status species include those species that are listed or being considered for listing as threatened or endangered by USFWS (Federal endangered, threatened, proposed, or candidate species); that are given sensitive species status by USFS or BLM; that are considered Wildlife of Special Concern in Arizona by the AGFD; or that are listed by the ADA.

Federally listed threatened and endangered species, and their designated critical habitat, are afforded protection under the ESA. Potential impacts to threatened and endangered species are evaluated for every land jurisdiction under each alternative. Impacts to species that are proposed to be listed, or are candidates for listing, are also evaluated in case they are listed during the *National Environmental Policy Act* (NEPA) process. USFS and BLM sensitive species are evaluated within their respective land jurisdiction under each alternative. Species designated as Wildlife of Special Concern in Arizona and plants listed by the ADA are not afforded special status on Federal lands. However, both USFS and BLM consider potential impacts to these species during the analysis for this EIS.

The USFS Sensitive category as reported in this document includes all federally protected and candidate species, plus species formerly included on USFWS Category 2 candidate species list (now discontinued, USFWS 1996). The USFS Sensitive status does not confer legal protection to a species; however, it does identify species that may need special management consideration to prevent population declines, which could necessitate listing under the ESA. USFS sensitive species are defined (FSM 2607.5) as "those plant and animal species identified by the Regional Forester for the Southwestern Region for which population viability is a concern, as evidenced by:

a. Significant current or predicted downward trends in population numbers or density, or

b. Significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution."

Criteria for BLM Sensitive species include those:

a. That are under status review by the USFWS,

b. Whose numbers are declining so rapidly that Federal listing may become necessary,

c. That typically have small and widely dispersed populations, or

d. That inhabit ecological refugia (a type of sensitive and relatively unaltered habitat) or other specialized habitats.

Designation as a Wildlife of Special Concern in Arizona protects a species in the State of Arizona against take (harm or harassment) as authorized under Arizona statute ARS Title 17-309. Plants listed by the ADA are regulated under the Arizona Native Plant Law (Arizona Revised Statutes Title 3, Chapter 7).

Harris Environmental Group completed a preliminary BE for the entirety of all of the proposed corridors (HEG 2001). Subsequently, Harris Environmental Group completed final Biological Assessments for the entirety of each of the action alternatives (the Western, Central, and Crossover Corridors, contained in Appendices D, E, and F, respectively) (HEG 2004a, 2004b, 2004c), as well as the 115-kV Interconnection (Appendix K, HEG 2004d). During the preparation of the Biological Assessment, Harris Environmental Group contacted USFWS, AGFD (which queried Heritage Data Management System), USFS, and BLM to obtain updated records and information of potential habitat of special-status species for Pima and Santa Cruz Counties.

A total of 100 special status species were identified by the above-referenced agencies as potentially occurring in the corridors (HEG 2004a, 2004b, 2004c) (Table 3.3–7). The Harris Environmental Group evaluated all 27 species listed by USFWS (Table 3.3–8), 43 USFS Sensitive, 13 BLM Sensitive, 11 Wildlife Species of Concern in Arizona, and 6 Arizona Department of Agriculture species (all of which are also USFS sensitive species). All three proposed corridors cross recently designated critical habitat for the Mexican spotted owl. There are approximately 54,881 acres (22,210 ha) of designated critical habitat within the Coronado National Forest. The Western Corridor crosses a portion of the Sycamore Canyon watershed upstream of critical habitat for Sonora chub.

Table 3.3–7. Comparison of Special Status Species Potentially Occurring in Each of the Corridors

Special Status Species	Corridor[a]			
	Western	Central	Crossover	115-kV Interconnection
Federal Threatened and Endangered Species				
Plants				
Canelo Hills Ladies' Tresses	-	-	-	-
Huachuca Water Umbel	-	-	-	-
Kearney's Blue Star	-	-	-	-
Nichol's Turk's Head Cactus	-	-	-	-
Pima Pineapple Cactus	X	X	X	X
Mammals				
Jaguar	X	X	X	-
Jaguarundi	-	-	-	-
Lesser Long-nosed Bat	X	X	X	X
Mexican Gray Wolf	X	X	X	-
Sonoran Pronghorn	-	-	-	-
Ocelot	-	-	-	-

Table 3.3–7. Comparison of Special Status Species Potentially Occurring in Each of the Corridors (*continued*)

Special Status Species	Corridor[a]			
	Western	Central	Crossover	115-kV Interconnection
Federal Threatened and Endangered Species (*continued*)				
Birds				
Cactus Ferruginous Pygmy-owl	X	X	X	X
Masked Bobwhite	-	-	-	-
Northern Aplomado Falcon	-	-	-	-
Southwestern Willow Flycatcher	X	X	X	-
Bald Eagle	-	-	-	-
Brown Pelican	-	-	-	-
Yellow-billed Cuckoo[b]	X	X	X	-
Mexican Spotted Owl	X	-	X	-
Mountain Plover	-	-	-	-
Amphibians				
Sonoran Tiger Salamander	-	-	-	-
Chiricahua Leopard Frog	X	-	X	-
Fish				
Loach Minnow	-	-	-	-
Desert Pupfish	-	-	-	-
Gila Topminnow	X	X	X	-
Sonora Chub	X	X	-	-
Spikedace	-	-	-	-
Gila Chub	-	-	-	-
USFS Sensitive				
Plants				
Alamos Deer Vetch	X	X	X	-
Arid Throne Fleabane	X	X	X	-
Arizona Giant Sedge	X	X	X	-
Bartram's Stonecrop	X	X	X	-
Beardless Chinch Weed	X	X	X	-
Broad-leaf Ground Cherry	-	X	X	-
Catalina Beardtongue	X	X	X	-
Chihuahuan Sedge	X	X	X	-
Chiltepine	X	X	X	-
Chiricahua Mt. Brookweed	X	X	X	-
Foetid Passionflower	X	X	X	-
Gentry Indigo Bush	X	X	X	-
Large-Flowered Blue Star	X	X	X	-
Lumholtz Nightshade	X	X	X	-
Mock-Pennyroyal	X	X	X	-
Nodding Blue-eyed Grass	X	X	X	-
Pima Indian Mallow	-	X	X	-
Santa Cruz Beehive Cactus	X	X	X	-
Santa Cruz Star Leaf	X	X	X	-
Santa Cruz Striped Agave	X	X	X	-
Seeman Groundsel	X	X	X	-
Sonoran Noseburn	X	X	X	-
Superb Beardtongue	X	X	X	-
Supine Bean	X	X	X	-
Sweet Acacia	X	X	X	-
Three-nerved scurf-pea	-	-	X	-
Thurber Hoary Pea	X	X	X	-

Table 3.3–7. Comparison of Special Status Species Potentially Occurring in Each of the Corridors (*continued*)

Special Status Species	Corridor[a]			
	Western	Central	Crossover	115-kV Interconnection
USFS Sensitive				
Thurber's Morning-glory	X	X	X	-
Virlet Paspalum	X	X	X	-
Weeping Muhly	X	X	X	-
Wiggins Milkweed Vine	X	X	X	-
Wooly Fleabane	X	X	X	-
Mammals				
Cave Myotis	X	X	X	-
Southern Pocket Gopher	X	X	X	-
Birds				
Northern Gray Hawk	X	X	X	-
Five-Stripped Sparrow	X	X	X	-
American Peregrine Falcon	X	X	X	-
Yellow-billed Cuckoo	X	X	X	-
Amphibians				
Lowland Leopard Frog	X	X	X	-
Western Barking Frog	X	X	X	-
Reptiles				
Giant Spotted Whiptail	X	X	X	-
Mexican Garter Snake	X	X	X	-
Invertebrates				
Arizona Metalmark	X	X	X	-
BLM Sensitive				
Plants				
Balloonvine	X	X	X	-
False Grama	X	X	X	-
Tumamoc Globeberry	X	X	X	-
Mammals				
California Leaf-nosed Bat	X	X	X	-
Underwood's Mastiff Bat	X	X	X	-
Fringed Myotis	X	X	X	-
Pocketed Free-Tailed Bat	X	X	X	-
Big Free-Tailed Bat	X	X	X	-
Spotted Bat	X	X	X	-
Birds				
Western Burrowing Owl	X	X	X	-
Loggerhead Shrike	X	X	X	-
Rufous-winged sparrow	X	X	X	-
Reptiles				
Texas Horned Lizard	X	X	X	-
Wildlife of Special Concern In Arizona				
Mammals				
Mexican Long-tongued Bat	X	X	X	-
Birds				
Black-bellied Whistling Duck	X	X	X	-
Elegant Trogon	X	X	X	-
Osprey	X	X	X	-
Crested Caracara	X	X	X	-
Thick-billed Kingbird	X	X	X	-
Rose-throated Becard	X	X	X	-

Table 3.3–7. Comparison of Special Status Species Potentially Occurring in Each of the Corridors (*continued*)

Special Status Species	Corridor[a]			
	Western	Central	Crossover	115-kV Interconnection
Wildlife of Special Concern In Arizona (*continued*)				
Tropical Kingbird	X	X	X	-
Amphibians				
Great Plains narrow-mouthed Toad	X			-
Reptiles				
Desert Tortoise (Sonoran)	X			-
Mexican Vine Snake	X	X	X	-
Arizona Department of Agriculture Plants				
Bartram's Stonecrop	X	X	X	-
Gentry Indigo Bush	X	X	X	-
Santa Cruz Striped Agave	X	X	X	-
Catalina Beardtongue	X	X	X	-
Santa Cruz Beehive Cactus	X	X	X	-
Pima Indian Mallow	-	X	X	-

[a] An X in the "Corridor" denotes that a special status species may potentially occur in that corridor.
Note: "-" denotes no potential occurrence of Special Status Species.
[b]Indicates that the species is a candidate species and is not a listed special status species.
Source: HEG 2004a, 2004b, 2004c.

Table 3.3–8. Federally Listed Species Potentially Occurring in Pima and Santa Cruz Counties

Common Name	Status [a]	Corridor Species May Occur in:	Preferred Habitat
Plants			
Canelo Hills Ladies' Tresses	E	None	Occurs in finely grained, highly organic, saturated soils of Cienegas below 5,000 ft. Known range is located well outside the three corridors.
Huachuca Water Umbel	E	None	Cienegas, perennial low gradient streams, and wetlands between 3500-6500 ft
Kearney's Blue Star	E	None	Known only from west-facing drainages in the Baboquivari Mountains.
Nichol's Turk's Head Cactus	E	None	Found in unshaded microsites in Sonoran desertscrub on dissected alluvial fans at the foot of limestone mountains.
Pima Pineapple Cactus	E	All	Occurs in alluvial basins or on hillsides in Semidesert Grassland in a wide range of soils on land with less than 10-15% slope.
Mammals			
Jaguar	E	All	Typically occurs in large canyon bottoms where surface water occurs and is also found in Sonoran Desertscrub up through subalpine conifer forest.
Jaguarundi	E	None	Occurs in humid tropical and sub-tropical forests, savannahs, and semi-arid thornscrub.

Table 3.3–8. Federally Listed Species Potentially Occurring in Pima and Santa Cruz Counties (*continued*)

Common Name	Status [a]	Corridor Species May Occur in:	Preferred Habitat
Lesser Long-nosed Bat	E	All	Desertscrub habitat with agave and columnar cacti present as food plants; day roosts in caves and abandoned tunnels.
Mexican Gray Wolf	E	None (however, potentially suitable habitat is present in all three corridors)	Historically occurred in chaparral, woodland, and forested areas. Only known population is an "experimental nonessential population" introduced in the Blue Primitive Area in eastern Arizona.
Ocelot	E	None	Occurs in humid tropical and sub-tropical forests, savannahs, and semi-arid thornscrub.
Sonoran Pronghorn	E	None	Found in broad intermountain alluvial valleys with creosote-bursage and palo verde-mixed cacti associations. Known range is located well outside the three corridors.
Birds			
Cactus Ferruginous Pygmy-owl	E	All	Mature cottonwood/willow, mesquite bosque, and Sonoran Desertscrub.
Masked Bobwhite	E	None	Desert grasslands with diversity of dense native grasses, forbs, and brush. Presently only known from reintroduced populations on Buenos Aires National Wildlife Refuge. Known range is located well outside the three corridors.
Northern Aplomado Falcon	E	None	Occurs in grassland and savannah. Known range is located well outside the three corridors.
Southwestern Willow Flycatcher	E	All	Occurs and nests in dense riparian habitats along streams where cottonwood, willow, boxelder, tamarisk are present.
Bald Eagle	T	None	Large trees or cliffs near water (reservoirs, rivers, and streams) with abundant prey.
Brown Pelican	T	None	Coastal land and islands; species found around many Arizona lakes and rivers
Mexican Spotted Owl	T	Western Crossover	Occurs in mature forest and woodland, shady wooded canyons and steep canyons.
Mountain Plover	P	None	Sporadically occurs in open arid plains, short-grass prairies, and cultivated farms.
Yellow-billed Cuckoo	C	All	Occurs in riparian areas dominated by tall cottonwood and willow trees.
Fish			
Desert Pupfish	E	None	Occurs below 5,000 ft. in shallow springs, small streams, and marshes. Tolerates saline and warm water. Known range is located well outside the three corridors.
Gila Chub	E	None	Small streams and cienegas; Prefer deeper pods with cover.
Gila Topminnow	E	All	In Arizona, most of the remaining populations occur in the Santa Cruz River system.

Table 3.3–8. Federally Listed Species Potentially Occurring in Pima and Santa Cruz Counties (*continued*)

Common Name	Status [a]	Corridor Species May Occur in:	Preferred Habitat
Loach Minnow	T	None	A benthic species of small to large perennial streams with swift shallow water over cobble and gravel.
Sonora Chub	T	Western	Occurs in perennial and intermittent small to moderate streams with boulders and cliffs.
Spikedace	T	None	Occurs in moderate to large perennial streams with gravel cobble substrates and moderate to swift velocities over sand and gravel substrates.
Amphibians			
Sonoran Tiger Salamander	E	None	Lives in moist or damp areas such as rodent burrows and rotting logs. Breeds in stock tanks. Known range is located well outside the three corridors.
Chiricahua Leopard Frog	T	Western Crossover	Typically occurs in a wide variety of water sources in deserts, grasslands, chaparral, and oak woodlands.

[a] USFWS Endangered (E), Threatened (T), Proposed (P), Candidate (C).
Source: HEG 2004a, 2004b, 2004c.

Detailed evaluations of threatened and endangered species are provided in the Biological Assessments in Appendices D, E, and F.

3.3.3.1 *Western Corridor*

ESA Listed Species

Relative to the Western Corridor, either: (1) these species are known to occur, (2) these species have the potential to occur, (3) suitable habitat exists, or (4) these species could be indirectly impacted. Below is the status, a description and distribution of the species, relative to the Western Corridor.

Cactus Ferruginous Pygmy-owl (*Glaucidium brasilianum cactorum*)-Endangered. Habitat for cactus ferruginous pygmy-owl, as defined by the USFWS, is present throughout the majority of the Western Corridor. However, no cactus ferruginous pygmy-owls are known to occur in the Western Corridor and none were detected during surveys by biologists at 142 call points in 2001 and 140 call points in 2002 (HEG 2004a). Historically cactus ferruginous pygmy-owls have been known to occur in Sycamore Canyon on the Nogales Ranger District of the Coronado National Forest (HEG 2004a), but USFS surveys in 1997 and 1998 failed to detect any individuals. In 1999 USFS biologists conducted 58 cactus ferruginous pygmy-owl habitat assessments in the Tumacacori EMA and identified four areas west and southwest of all of the corridors that warranted cactus ferruginous pygmy-owl surveys. As a result, approximately 2,300 acres (931 ha) were surveyed. No cactus ferruginous pygmy-owls were detected in these four areas (HEG 2004a).

Chiricahua Leopard Frog (*Rana chiricahuensis*)-Threatened. Chiricahua leopard frogs are known to presently occur at four locations within the Tumacocori EMA and there are 17 historical records in the Pajarito and Atascosa Mountains (HEG 2004a). None of these populations are located in the Western Corridor. No surveys for Chiricahua leopard frog have been completed in the Western Corridor.

Gila Topminnow (*Poeciliopsis occidentalis occidentalis*)- Endangered. Gila topminnows are currently known from 14 natural locations in Arizona. Historically, this species occurred in the Santa Cruz River and other major drainages throughout Arizona and Mexico. The nearest known present-day population is approximately 12 mi (19 km) northeast of Nogales, Arizona (approximately 12 mi [19 km] east of any of the corridors). No Gila topminnow occur in the Tumacacori EMA (HEG 2004a), or any other portion of the Western Corridor, and there are no plans for introductions in any locations.

Jaguar (*Panthera onca*)- Endangered. Jaguars have been documented within 2 mi (3.2 km) of the Western Corridor. It is likely that resident breeding populations occurred in the southwestern United States into the 20th century; however, there are presently no known breeding populations of jaguar in the United States. There have been numerous confirmed and unconfirmed sightings during the 1980s and 1990s of individuals along the Arizona-Mexico border. The most recent sightings of jaguar occurred in the Tumacacori EMA and this area is the most likely to provide habitat and support the future existence of this species in the United States (HEG 2002a). It is unknown how many, if any, jaguar occur in the southwestern United States year round. Jaguars typically inhabit large canyon bottom habitats with surface water but occur in a wide variety of habitats.

Lesser Long-nosed Bat (*Leptonycteris curasoae yerbabuenae*) - Endangered. No lesser long-nosed bat roosts are known to exist in the Western Corridor. However, numerous caves, crevices, and abandoned mines, which may be suitable lesser long-nosed bat roosts, are present in the Tumacocori-Atascosa Mountains (HEG 2004a). The Corridor is within foraging distance of two known roost sites in southern Arizona and food plants (agave and saguaro) are present throughout portions of the Western Corridor.

Mexican Gray Wolf (*Canis lupus baileyi*)- Endangered. Mexican gray wolves are believed to have been extirpated (killed off completely) from Arizona by 1960 and from Mexico by 1980 by intensive predator control programs (Hoffmeister 1986). Historically, this species inhabited most non-desert areas above 4,000 ft (1,220 m) in oak, pine/juniper savannahs, and mixed conifer woodlands (USFWS 1998). Mexican gray wolf may have historically occurred in portions of the Western Corridor.

Mexican Spotted Owl (*Strix occidentalis lucida*) - Threatened. There are five Protected Activity Centers in the Tumacacori EMA (HEG 2004a). Although the Western Corridor does not cross any Protected Activity Centers, it is within 1 mi (1.6 km) of two different Protected Activity Centers south of Ruby Road. Much of the remaining Western Corridor lacks habitat for Mexican spotted owl.

On August 31, 2004, the USFWS designated critical habitat under the Endangered Species Act of 1973, as amended, for the Mexican spotted owl (69 FR 51382). The owl inhabits canyon and forest habitats across a range that extends from southern Utah and Colorado, through Arizona, New Mexico, and west Texas, to the mountains of central Mexico. The USFWS designated approximately 8.6 million acres (3.5 million hectares) of critical habitat in Arizona, Colorado, New Mexico, and Utah, on Federal lands. One of the critical habitat areas designated by the USFWS for the Mexican spotted owl is located in the Coronado National Forest, west of Nogales. With respect to the proposed action in this EIS, the proposed Western Corridor crosses the recently designated critical habitat for the Mexican spotted owl. Figure 3.3-2 shows the critical habitat designation with respect to the Western Corridor. Under Section 7 of the ESA, Federal agencies are required to ensure that actions they authorize, fund, or carry out are not likely to destroy or adversely modify designated critical habitat (see Appendices D, E, and F).

Pima Pineapple Cactus (*Coryphantha scheeri* var.*robustispina*)- Endangered. Pima pineapple cacti occur in patches throughout most of the northern portion of the Western Corridor. A total of 70 Pima pineapple cacti were located during surveys conducted from July 17, 2002, through March 31, 2003 (HEG 2004a). Within the Western Corridor, Pima pineapple cacti were located only between the boundary of the Coronado National Forest and the South Substation. Of the 70 Pima pineapple cacti

found in the Western Corridor, three were found on the BLM land (two were within the proposed 125-ft [38.1-m] right-of-way [ROW]).

Southwestern Willow Flycatcher (*Empidonax traillii extimus*)- Endangered. Southwestern willow flycatchers are not known to occur in the Western Corridor. However, Harris Environmental Group (2004a) identified potential habitat (that is, broad-leaved deciduous riparian habitat) where the Western Corridor crosses Sopori Wash. Individuals could use this area during migration but not for breeding.

Sonora Chub (*Gila ditaenia*)- Threatened. No Sonora chubs are known to occur within the Western Corridor. However, populations are known to occur in several streams and springs within the Tumacacori EMA, and critical habitat has been designated approximately 1 mi (1.6 km) downstream of the Western Corridor. Sonora chub populations fluctuate widely in response to wet/dry periods. This species expands from pools into runs and riffles as they become available during rainy seasons.

USFS Sensitive Species

Forty USFS sensitive species were identified as potentially occurring in the Western Corridor (HEG 2004a) (see Table 3.3-9). A description of these species and habitat requirements can be found in the Biological Assessment for the Western Corridor, Appendix D.

Table 3.3-9. USFS Sensitive Species Potentially Occurring in the Western Corridor

Plants		
Alamos Deer Vetch	Gentry Indigo Bush	Supine Bean
Arid Throne Fleabane	Large-Flowered Blue Star	Superb Beardtongue
Arizona Giant Sedge	Lumholtz Nightshade	Sweet Acacia
Bartram's Stonecrop	Mock-Pennyroyal	Thurber Hoary Pea
Beardless Chinch Weed	Nodding Blue-eyed Grass	Thurber's Morning-glory
Catalina Beardtongue	Santa Cruz Beehive Cactus	Virlet Paspalum
Chihuahuan Sedge	Santa Cruz Star Leaf	Weeping Muhly
Chiltepene	Santa Cruz Striped Agave	Wiggins Milkweed Vine
Chiricahua Mt. Brookweed	Seeman Groundsel	Wooly Fleabane
Foetid Passionflower	Sonoran Noseburn	
Mammals		
Cave Myotis	Southern Pocket Gopher	
Birds		
American Peregrine Falcon	Northern Gray Hawk	Yellow-billed Cuckoo
Five-Stripped Sparrow		
Reptiles/Amphibians		
Giant Spotted Whiptail	Lowland Leopard Frog	Mexican Garter Snake
Western Barking Frog		
Invertebrates		
Arizona Metalmark		

BLM Sensitive Species

Thirteen BLM sensitive species were identified as potentially occurring in the Western Corridor (HEG 2004a) (see Table 3.3-10). A description of these species and habitat requirements can be found in the Biological Assessment for the Western Corridor, Appendix D.

Table 3.3-10. BLM Sensitive Species Potentially Occurring in the Western Corridor

Plants		
Balloonvine	False Grama	Tumamoc Globeberry
Mammals		
Big Free-Tailed Bat	Californian leaf-nosed Bat	Fringed Myotis
Pocketed Free-Tailed Bat	Spotted Bat	Underwood's Mastiff Bat
Birds		
Rufous-winged sparrow	Loggerhead Shrike	Western Burrowing Owl
Reptiles		
Texas Horned Lizard		

Wildlife of Special Concern In Arizona

Eleven AGFD Wildlife of Special Concern in Arizona were identified as potentially occurring in the Western Corridor (HEG 2004a) (see Table 3.3-11). A description of these species and habitat requirements can be found in the Biological Assessment for the Western Corridor, Appendix D.

Table 3.3-11. AGFD Wildlife of Special Concern in Arizona Potentially Occurring in Western Corridor

Mammals		
Mexican Long-tongued Bat		
Birds		
Black-bellied Whistling Duck	Crested Caracara	Elegant Trogon
Osprey	Thick-billed Kingbird	Tropical Kingbird
Rose-throated Becard Great Plains		
Reptiles/Amphibians		
Desert Tortoise (Sonoran)	Mexican Vine Snake	Narrow-mouthed Toad

Arizona Department of Agriculture Plants

Five plants afforded protection under the Arizona Native Plant Law were identified as potentially occurring in the Western Corridor (see Table 3.3-12). Plants that are classified as "Salvage Restricted" are plants that have a high potential for theft or vandalism of the whole plant. Collection, salvage, or harvesting requires a permit from the ADA. Plants that are classified as "Highly Safeguarded" are those species of native plants and parts of plants, including the seeds and fruit, whose prospects for survival in Arizona are in jeopardy or which are in danger of extinction.

Table 3.3-12. Plants Protected by Arizona Native Plant Law that are Potentially Occurring in the Western Corridor

Common Name	Status
Bartram's Stonecrop	Salvage Restricted
Catalina Beardtongue	Highly Safeguarded
Gentry Indigo Bush	Highly Safeguarded
Santa Cruz Beehive Cactus	Highly Safeguarded
Santa Cruz Striped Agave	Highly Safeguarded

3.3.3.2 *Central Corridor*

ESA Listed Species

According to the Harris Environmental Group (2004b), seven federally listed species could potentially be impacted under this alternative. These species include: cactus ferruginous pygmy-owl, Pima pineapple cactus, southwestern willow flycatcher, lesser long-nosed bat, jaguar, Gila topminnow, and Mexican gray wolf. With the exception of Pima pineapple cactus, descriptions of these species, their status, and distribution are provided above. The distribution of Pima pineapple cactus within the Central Corridor is provided below.

Mexican Spotted Owl (*Strix occidentalis lucida*) -Threatened. The proposed Central Corridor crosses approximately 2 mi (3 km) of the federally designated critical habitat for the Mexican spotted owl. Figure 3.3-3 shows the critical habitat designation with respect to the Central Corridor.

Pima Pineapple Cactus (*Coryphantha scheeri* var.*robustispina*) -Endangered. Pima pineapple cacti occur in patches throughout most of the Central Corridor. A total of 78 Pima pineapple cacti were located during surveys conducted from July 17, 2002 through March 31, 2003 (HEG 2004a). Within the Central Corridor, Pima pineapple cacti were only found between the Coronado National Forest boundary and the South Substation. Of the 78 Pima pineapple cacti found in the Central Corridor, three were found on the BLM land (two were within the proposed 125-ft [38.1 m] ROW).

USFS Sensitive Species

Forty-two USFS sensitive species were identified as potentially occurring in, or within 3 mi (4.8 km) of the Central Corridor (HEG 2004b). In addition to those species listed above under Section 3.3.3.1, Pima Indian mallow (*abutilon parishii)*and broad-leaf ground cherry (*physalis latiphysa)* potentially occur in the Central Corridor. A description of these species and habitat requirements can be found in the Biological Assessment for the Central Corridor, Appendix E.

BLM Sensitive Species

BLM sensitive species are identical to those addressed in Section 3.3.3.1 (HEG 2004b).

Wildlife of Special Concern In Arizona

Wildlife of Special Concern in Arizona species are identical to those addressed in Section 3.3.3.1 (HEG 2004b).

Arizona Department of Agriculture Plants

In addition to the five ADA plants listed under Section 3.3.3.1, Pima Indian mallow may occur in the Central Corridor. Pima Indian mallow is considered "Salvage Restricted" under the Arizona Native Plant Law (HEG 2004b).

3.3.3.3 *Crossover Corridor*

ESA Listed Species

According to the Harris Environmental Group (2004c), nine federally listed and one candidate species could potentially be impacted under this alternative. The listed species include: Pima pineapple cactus, cactus ferruginous pygmy-owl, Mexican spotted owl, southwestern willow flycatcher, lesser long-nosed bat, jaguar, Gila topminnow, Chiricahua leopard frog, and Mexican gray wolf. The candidate species is the yellow-billed cuckoo. With the exception of Mexican spotted owl, the descriptions of these species, their status, and distribution are provided above under Section 3.3.3.1. The survey results for Pima pineapple cactus are identical to those under Section 3.3.3.1 because all of the individuals found were located within the portion of the Crossover Corridor shared with the Western Corridor.

Mexican Spotted Owl (*Strix occidentalis lucida*) -Threatened. There is one Protected Activity Center within 0.6 mi (0.9 km) of the Crossover Corridor near Peck Canyon (HEG 2004c). The Crossover Corridor crosses approximately 2 mi (3 km) of the recently designated critical habitat for the Mexican spotted owl. Figure 3.3-4 shows the critical habitat designation in relation to the Central Corridor.

USFS Sensitive Species

Forty-three USFS sensitive species were identified as potentially occurring in, or within 3 mi (4.8 km) of the Crossover Corridor (HEG 2004c). In addition to those species listed above under Section 3.3.3.2, three-nerved scurf-pea (*pediomelum pentaphyllum)* potentially occurs in the Crossover Corridor. A description of these species and habitat requirements can be found in the Biological Assessment for the Crossover Corridor, Appendix F.

BLM Sensitive Species

BLM sensitive species are identical to those addressed in Section 3.3.3.1 (HEG 2004c).

Wildlife of Special Concern In Arizona

Wildlife of Special Concern in Arizona species potentially occurring in the Crossover Corridor are identical to those addressed above in Section 3.3.3.1 (HEG 2004c).

Arizona Department of Agriculture Plants

The six ADA plants listed under Section 3.3.3.2 may also occur in the Crossover Corridor (HEG 2004c).

3.3.3.4 *115-kV Gateway and Valencia Substations Interconnection*

ESA Listed Species

Three threatened, or endangered species may potentially occur on or near the proposed interconnection. Descriptions of these species, their status and distribution are provided below.

Lesser long-nosed bat *(Leponycteris curasoae yerbabuenae)*. The lesser long-nosed bat uses caves and mines as roost sites. No potential roost sites were observed in the vicinity of the proposed interconnection area. However, a few agaves plants in the vicinity may provide some foraging habitat for this species.

Cactus ferruginous pygmy-owl (*Glaucidium brasilianum cactorum*). Suitable habitat for this federally listed, endangered species include riparian vegetation, Sonoran desertscrub, and semidesert grassland with drainages containing mesquite, hackberry, cottonwood, willow, and ash. The proposed transmission line crosses areas of semidesert grassland with mesquite, cottonwood, oak, and willow near ephemeral stream channels, and the entire corridor is below 4,000 feet.

Pima pineapple cactus (*Coryphantha scheeri robustispina)*. This species occurs in alluvial valleys or hillsides in desert, grasslands, or woodlands, between 2,300 and 5,000 feet in elevation. Suitable habitat for this species is present in the semidesert grassland along the proposed interconnection route. Surveys for these cacti should be conducted after the final route has been determined and before construction activities have begun.

3.3.4 Migratory Birds and Raptors

The *Migratory Bird Treaty Act* of 1918 (MBTA) governs the taking, killing, possession, transportation, and importation of migratory birds, their eggs, parts, and nests. The take of all migratory birds is governed by MBTA's regulation of taking migratory birds for educational, scientific, and recreational purposes and requiring harvest to be limited to levels that prevent over-utilization. Section 704 of MBTA states that the Secretary of the U.S. Department of Interior is authorized and directed to determine if, and by what means, the take of migratory birds should be allowed and to adopt suitable regulations permitting and governing take. The Secretary in adopting regulations is to consider such factors as distribution and abundance to ensure that take is compatible with the protection of the species (SWCA 2002a). Raptors are birds of prey including various types of hawks, falcons, eagles, vultures, and owls. Most raptors occurring in the study area are covered under MBTA.

Potential impacts of the proposed project on birds protected under the MBTA (migratory birds) were evaluated for all of the action alternatives (SWCA 2002a). This evaluation included a review of the migratory birds potentially occurring within the entire length of all of the corridors by habitat type preference.

There are no designated Important Bird Areas (IBA) within the proposed corridors. IBAs are sites designated by the Audubon Society that provide essential habitat for one or more species of bird. IBAs include sites for breeding, wintering, and/or migrating birds (Audubon 2001). IBAs may be a few acres or thousands of acres, but usually they are discrete sites that stand out from the surrounding landscape. IBAs may include public or private lands, or both, and they may be protected or unprotected. This is not a regulatory program.

The nearest IBAs are Sycamore Canyon, Arivaca Cienega/Arivaca Creek, and the Santa Rita Mountains. There is alos the proposed Tumacacori Highlands IBA that may include portions of one or more of the proposed corridors. The Santa Cruz River Valley retains many of the characteristics of the San Pedro

River, especially in reaches of the Santa Cruz River that currently receive treated sewage effluent (approximately 2 mi [3.2 km] east of the Central Corridor). For this reason, this feature may serve migratory birds in a similar manner to the San Pedro River.

Other features that are important to migratory birds include stock tanks, springs, and cliffs. Field surveys prior to the final design of the selected route could allow avoidance of these features.

3.3.4.1 *Western, Central, Crossover Corridors, and 115-kV Interconnection*

Table 3.3–13 lists migratory birds expected to occur regularly in the Western, Central, and Crossover Corridors. It is possible that any migratory bird listed under the MBTA could occur in these corridors, as well as the 115-kV interconnection, because of the high degree of mobility of birds.

Table 3.3–13. Bird Species Listed under the Migratory Bird Treaty Act that Are Likely to Occur in the Western, Central, and Crossover Corridors by Vegetation Type. [a]

Vegetation Type	Species
Sonoran Desertscrub	Harris' hawk, elf owl, Gila woodpecker, verdin, cactus wren, curve-billed thrasher, black-throated sparrow great-horned owl, red-tailed hawk, phainopepla, Lucy's warbler, and black-tailed gnatcatcher
Semidesert Grassland	Swainson's hawk, prairie falcon, loggerhead shrike, grasshopper sparrow, Savannah sparrow, lark bunting, and western kingbird
Madrean Evergreen Woodland	Arizona woodpecker, Mexican jay, bridled titmouse, Hutton's vireo, and black-throated gray warbler
Sonoran Riparian Deciduous Forest	yellow-billed cuckoo; violet-crowned, Lucifer, broad-billed, and blue-throated hummingbirds; zone-tailed, gray hawk, and black hawks; Mississippi kite; sulphur-bellied flycatcher; cliff swallow; yellow warbler; Bullock's oriole; summer tanager; rose-throated becard; and elegant trogon

[a] This list is not comprehensive, but is provided to indicate the diversity of birds potentially occurring in the corridors.

3.3.5 Coronado National Forest Management Indicator Species

All of the proposed transmission line corridors cross a portion of the Sky Island Region, which includes portions of southern Arizona, New Mexico, and northern Mexico. The term "Sky Islands" is used to describe isolated mountain ranges that are separated by grasslands or desert, which to varying degrees, are barriers to the movement of species that inhabit higher elevations. This region is located where the tropical, subtropical, and temperate climatic zones all converge. The resulting biological communities that inhabit the region include numerous plant and animal species that overlap at the edge of their ranges; thus these assemblages are relatively diverse in terms of the number and types of species present in specialized ecosystems within close proximity of each other.

Other locally important features include the unique topographic relief and geology of the region. Precipitation increases and temperature decreases with rising elevation creating a vertical range of habitat for various species. The proposed project area intercepts Forest Service lands that include the Tumacacori, Atascosa, and Pajarito Mountains. Elevations range from approximately 4,500 to 6,400 ft (1,372 to 1,951 m) above mean sea level. Major drainages in the subject portions of the Forest include Murphy Canyon, Peck Canyon, Sycamore Canyon, and Walker Canyon. Forest System Land types that fall within the proposed study corridors include Semidesert grassland, Madrean Evergreen Woodland, and Sonoran Desertscrub. Although numerous species in the region are considered "rare", many are at the limits of their normal range and may be more common elsewhere in the United States or Mexico. This is true of several of the Management Indicator Species (MIS) in the project area.

Management Indicator Species Identification

Of the 33 total MIS on the Forest, 11 species and one group (cavity nesters) were selected for analysis as management indicators at the project level based on their known occurrence within or near the project area or presence of suitable habitats (Table 3.3-14). The remaining species were eliminated from consideration in this analysis because their known distributions are well outside of the project area or the project area does not contain suitable habitats for those species (USFS 2004d).

Table 3.3-14. Management Indicator Species (MIS) occurring on the Coronado National Forest and reasons for selecting project-level MIS.

Species	Evaluation for Analysis
Coues White-tailed deer	Occurs within analysis area; widespread suitable habitat.
Black bear	Occurs within analysis area; suitable habitat available
Elegant trogon	Occurs near analysis area; uncommon summer resident in riparian canyons in Atascosa and Pajarito Mountains.
Northern Gray hawk	Documented in the project area; limited suitable habitat.
Bell's vireo	Documented at Tumacacori Monitoring Avian Productivity and Survivorship (MAPS) station 1997-2001 (Turner 2002). No suitable habitat in analysis area.
Montezuma quail	Occurs within analysis area; suitable habitat available
Peregrine falcon	Known eyrie in analysis area.
Primary and secondary cavity nesters	Occur within analysis area; suitable habitat available
Western barking frog	Status in the project area unknown; limited suitable habitat. A single 1965 record from Pajarito Mts.
Gila topminnow	Does not occur within analysis area; proposed reintroduction site in Peck Canyon.
Gila chub	Does not occur within analysis area; proposed reintroduction site in Peck Canyon.
Sonora chub	Does not occur within analysis area; occupied habitats downstream in Sycamore Canyon.

Primary and Secondary Cavity Nesters

Population status. Primary cavity nesters are those species that excavate and nest in cavities, whereas secondary cavity nesters use cavities excavated by primary cavity nesters. Six primary cavity nesters and twenty-six secondary cavity nesters have potential to occur in the study area. On the Forest, cavity nesters occur primarily within forested areas including riparian habitats, Madrean evergreen woodlands, coniferous forests, and in Sonoran desert habitats that contain saguaro cactus (*Carniegia gigantea*). Within the greater Tumacacori Ecosystem Management Area (EMA) Woodland, coniferous forest and riparian vegetation types comprise approximately 117,800 acres (47,672 ha) of suitable habitat for cavity nesters. Although the species in this group specifically nest in cavities, some of them make use of many other habitats in completing their life cycles (USFS 2004d).

3.3.6 Invasive Species

Under Executive Order (EO) 13112, Invasive Species (February 3, 1999), projects which occur on Federal lands or are federally funded must: "subject to the availability of appropriations, and within Administration budgetary limits, use relevant programs and authorities to: (1) prevent the introduction of invasive species; (2) detect and respond rapidly to, and control, populations of such species in a cost-

effective and environmentally sound manner; (3) monitor invasive species populations accurately and reliably; and (4) provide for restoration of native species and habitat conditions in ecosystems that have been invaded." Invasive species are most likely to occur in areas that have existing disturbances to soil. None of the proposed corridors have been specifically surveyed for the presence of invasive species and no standard management practices have been implemented at this time. However, the Coronado National Forest has completed the Environmental Assessment (EA) for the Invasive Exotic Plant Management Program (Coronado National Forest 2004) for all lands under their administration. The Decision Notice and Finding of No Significant Impact (FONSI) was signed on September 8, 2004 (USFS 2004c).

3.3.6.1 *Western, Central, and Crossover Corridors*

Given the vast expanse of land in all of the Corridors, it is likely that some invasive species listed in *EO 13112* occur. In the EA completed by the Coronado National Forest, three invasive species have been identified on lands administered by USFS: tree of heaven (*Ailanthus altissima)*, salt cedar (*Tamarix L.*), and Lehman lovegrass (*Eragrotis lehmanniana)* (Coronado National Forest 2004). However, it is possible that other invasive species are present on, and adjacent to, the Coronado National Forest. No noxious weeds listed under *EO 13112* are known to occur on lands administered by BLM. However, BLM has identified that buffelgrass (*Cenchrus ciliaris)* is considered as a noxious weed and is located on BLM-administered lands.

3.4 CULTURAL RESOURCES

This section discusses the cultural resources in the vicinity of the proposed Tucson Electric Power Company (TEP) Sahuarita-Nogales Transmission Line project. The discussion is divided into Section 3.4.1, Archaeological and Historical Sites, and Section 3.4.2, Native American Concerns and traditional cultural properties.

Federal agency responsibilities with regard to cultural resources are addressed by a number of laws, implementing regulations, Executive Orders (EOs), programmatic agreements, and other requirements, including the *National Historic Preservation Act* of 1966 (NHPA), *Native American Graves and Repatriation Act* (NAGPRA), *American Indian Religious Freedom Act* (AIRFA), EO 13007 "Native American Religious Practices," and EO 13175 "Consultation and Coordination With Indian Tribal Governments." This protection extends to sites on private land potentially affected by actions requiring Federal approval. The principal Federal law addressing cultural resources is the NHPA, as amended (16 USC 470), with its implementing regulations (36 CFR Part 800). NHPA describes the process for identifying and evaluating historic properties; assessing the effects of Federal actions on historic properties; and consulting to avoid, reduce, or minimize adverse effects. The term "historic properties" refers to cultural resources that meet specific criteria for eligibility for listing on the National Register of Historic Places (NRHP). Section 106 of the NHPA requires that Federal agency decisions affecting these places consider cultural and historic values and the options available to protect these properties. Section 106 also requires consultation with Indian tribes whose traditional lands may be affected by "undertakings," and EO 13175 delineates the Government-to-Government Relationship between Native American Tribal Governments and Federal agencies through which these consultations must occur. NAGPRA was enacted in 1990 to protect Native American burials, associated funerary objects, and objects of cultural patrimony encountered on Federal land. The AIRFA and EO 13007 both pertain to Native American sacred sites. EO 13007 states that Federal agencies must "to the extent practicable and not clearly inconsistent with essential agency functions, accommodate access to and ceremonial use of Indian sacred sites by Indian religious practitioners and avoid adversely affecting the physical integrity of such sacred sites."

The U.S. Department of Energy (DOE), as the lead Federal agency, is responsible for identifying, evaluating, and assessing effects of construction and operation of the TEP Sahuarita-Nogales Transmission Line proposed project on cultural resources, in concurrence with the State Historic Preservation Officer (SHPO) and other consulting parties. The exact locations of cultural resources (including historical sites, archaeological sites, and traditional cultural properties) are not disclosed in an effort to help preserve the integrity of the sites. The descriptions below focus on known densities of sites within the corridors. Throughout this discussion, all federally recognized American Indian political entities consulted in this project are collectively termed the "tribes," even though many are Nations or Communities. DOE and the cooperating agencies recognize that each tribe is an individual, sovereign nation with a unique trust relationship to the U.S. Government.

3.4.1 Archaeological and Historical Sites

DOE and Arizona State Museum personnel conducted record searches at the Arizona State Museum using Arizona Online Database of Archaeological Projects and Sites (AZSITE) in order to determine the number and type of previously documented archaeological and historical sites within the 0.25-mi (0.40-km) study corridor for each alternative. The Forest Service (USFS) provided information on known sites within the study corridors on the Coronado National Forest. DOE determined the degree to which each of the corridors had been previously surveyed for archaeological and historical sites by using AZSITE and data provided by USFS. Three 20th century sites are known to be crossed by all three of the proposed corridors: the historic alignment of Ruby Road (see Figure 3.1–1), the Potrero erosion control features

constructed by the Civilian Conservation Corps (approximately 1.25 mi [2 km] northwest of Nogales), and a water conveyance feature known as the Ruby Pipeline that runs west from the Santa Cruz River through Peck Canyon to the town of Ruby. These three sites are included below in discussions of the total sites documented within the individual proposed corridors. The Atascosa Lookout Tower, an historic property northeast of the Western Corridor in the Atascosa Mountains, is outside the right-of-way (ROW) of the three proposed corridors. Additional sites that have been documented but have yet to be registered with the Arizona State Museum, USFS, or SHPO may also be located within each of the proposed corridors.

3.4.1.1 *Western Corridor*

The Western Corridor would involve the construction of a new transmission line that runs from the South Substation, located on the west bank of the Santa Cruz River in Sahuarita, across the eastern descent of the Sierrita Mountains, eventually passing through the Tumacacori and Atascosa Mountains to the U.S.-Mexico border west of Nogales, Arizona (all locations noted on Figure 1.1–4, unless otherwise noted below).

Twenty-two previously identified archaeological and historical sites have been documented within this corridor, including six sites on the Coronado National Forest. Archaeological terms and site types are defined in the text box that follows. Recorded Native American sites include five artifact scatters, two artifact scatters with rock features, one site with potential habitation features, three rock shelters with artifact scatters, one bedrock mortar site, and one pictograph site. Historical sites include two habitation sites, the historic alignment of Ruby Road, Peña Blanca Civilian Conservation Corps Camp F-64-A, a set of erosion control features constructed by the Civilian Conservation Corps, and a water conveyance feature known as the Ruby Pipeline. Additional sites include a multicomponent site containing a prehistoric artifact scatter and a historical ranch, a site consisting of two rock walls of unknown age, and an isolated check dam of unknown age. None of these sites are currently listed in the NRHP; however, all should be considered potentially eligible for listing until further work is done to evaluate their eligibility.

Site density varies directly with the intensity of survey, with greater number of sites located in the areas more intensively surveyed. Fourteen of the 22 known sites are located on the descent of the Sierrita Mountains west of Sahuarita and Green Valley, 2 are located near the intersection of the Western Corridor and Sopori Wash (see Figure 3.7–1), and the remaining 6 are located in the mountainous areas of the Tumacacori and Atascosa Mountains on the Coronado National Forest. Data collected from AZSITE and USFS indicate that less than 15 percent of the Western Corridor has been previously surveyed for cultural resources. The area around Sahuarita and a portion of the eastern descent of the Sierrita Mountains represent the majority of previously surveyed land. Because only a small percentage of the Western Corridor has been previously surveyed for cultural resources, it is extremely likely that additional prehistoric and historic sites exist within it. Based upon the varied terrain of the Western Corridor, a wide range of archaeological site types are expected. Prehistoric and historic habitation sites are commonly located along river and wash corridors, whereas the mountainous segment may contain Native American rock art sites and shrines, as well as Historic Period ranching and mining-related sites. Intermontane valleys (valleys between mountains) are expected to contain a wide variety of prehistoric and historic sites.

Archaeological Terms and Site Types

Artifact Scatter	Archaeological site resulting from often undetermined past activity, represented only by artifacts on the present ground surface; often, there is little or no depth to the site deposits. These may represent the only visible remains of a long-term habitation site, or, in contrast, a limited activity site (pot break, flint knapping) or agricultural field where miscellaneous artifacts were included in field mulch.
Bedrock Mortar	Place where grinding or crushing of food or other materials took place on a large rock; these are not movable artifacts.
Cave Site	An archaeological site in a cave; the entrance of a cave is generally smaller than the depth into the rock cliff of the cave, as opposed to a rock shelter (see below).
Check Dam	Rocks aligned to form a small dam, constructed in a gully or on a slope, to decrease the water flow velocity and promote deposition of sediment.
Multicomponent Site	An archaeological site that contains the remains of more than one culture and often includes archaeological remains from more than one time period.
Petroglyph	An engraving on a rock produced by grinding, pecking, or incising.
Pictograph	A painting on rock.
Prehistoric	Of or pertaining to the time before written history in a given region.
Protohistoric	Of or pertaining to the time immediately preceding the advent of written documents in a given region. In practice, this is the period of time (from the arrival of Europeans in North America) until the time when written records of the area in question were produced.
Rancheria	A settlement of dispersed, unconnected houses common to historic groups in southern Arizona and California; as opposed to "pueblo," which is a settlement made up of connected, multi-household rooms.
Rock Art	A general term for figures or designs painted or engraved on rock or formed through the placement of boulders.
Rock Feature	A human-made line, ring, cairn, or pile of rocks that could have been used for a number of different purposes in the past, including agricultural and religious uses.
Rock Shelter	A shallow overhang in a rock face, with an "entrance" wider than it is deep. When mentioned in archaeology, the shelter of the rock overhang was generally used by people in the past.
Tinajas	Rock tanks in which rain water collects.

3.4.1.2 *Central Corridor*

The Central Corridor runs from the South Substation, located on the west bank of the Santa Cruz River in Sahuarita, across the eastern descent of the Sierrita Mountains, eventually passing between the Santa Cruz River and the Tumacacori and Atascosa Mountains to the U.S.-Mexico border west of Nogales, Arizona (locations noted on Figure 1.1–4). Most of the Central Corridor would follow or cross an existing El Paso Natural Gas Company (EPNG) pipeline alignment. Three nationally significant historical sites are located near the Central Corridor: Tumacacori National Historical Park (in Tumacacori), Tubac Presidio State

Historic Park (in Tubac), and the Juan Bautista de Anza National Historic Trail (immediately adjacent to the Santa Cruz River in the proposed project area).

Six previously identified archaeological and historical sites have been documented within this corridor, including four sites on the Coronado National Forest. Recorded Native American sites include one artifact scatter and one partially excavated cave site. Historical sites include the historic alignment of Ruby Road, a set of erosion control features constructed by the Civilian Conservation Corps, and a water conveyance feature known as the Ruby Pipeline. One isolated check dam of unknown age has also been documented within this corridor. Additionally, several historical O'Odham rancherias are known to have existed along the Santa Cruz River south of Tumacacori and may lie within the Central Corridor. None of these sites are currently listed in the NRHP; however, all should be considered potentially eligible for listing until further work is done to evaluate their eligibility.

Site density is low within the Central Corridor probably because very little of the corridor has been intensively surveyed. Two sites have been documented on the eastern descent of the Sierrita Mountains west of Sahuarita and Green Valley. The remaining four documented sites are located on the Coronado National Forest.

Data collected from AZSITE and USFS indicate that less than 15 percent of the Central Corridor has been previously surveyed for cultural resources. The area around Sahuarita and a portion of the eastern descent of the Sierrita Mountains west of Green Valley represent the majority of previously surveyed lands. Because only a small percentage of the Central Corridor has been previously surveyed for cultural resources, it is extremely likely that additional prehistoric and historic sites exist within this corridor. No significant difference in site density is expected between the Option 1 and 2 sub-routes. However, because Option 2 follows an existing utility corridor, any resources on this route are slightly more likely to have been discovered. Based upon available data, site density south of Tucson is highest along the Santa Cruz River and along major washes that flow into the Santa Cruz River. These are, however, the areas that have been most intensively surveyed in the past.

3.4.1.3 *Crossover Corridor*

The Crossover Corridor would involve the construction of a new transmission line from the South Substation, located on the west bank of the Santa Cruz River in Sahuarita, across the eastern descent of the Sierrita Mountains, eventually passing through the Tumacacori Mountains (locations noted on Figure 1.1–4). The corridor turns eastward and follows Peck Canyon, located between the Tumacacori and Atascosa Mountains, and turns south again running between the Santa Cruz River and the Atascosa Mountains to the U.S.-Mexico border west of Nogales, Arizona.

Twenty-seven previously identified archaeological and historical sites have been documented within this corridor, including 11 on the Coronado National Forest. The prehistoric to historic Native American sites include seven artifact scatters, two artifact scatters with rock features, one site with potential habitation features, six rock shelters with artifact scatters (three rock shelters contain rock art), one bedrock mortar site, and one partially excavated cave site. Historical sites include two habitation sites, the historic alignment of Ruby Road, a set of erosion control features constructed by the Civilian Conservation Corps, a water conveyance feature known as the Ruby Pipeline, and a stone monument and historical artifact scatter marking the location of the historic Peck's Ranch. Additional sites include a multi-component site consisting of a prehistoric artifact scatter and a historical Euro-American ranch, a site consisting of two rock walls of unknown age, and an isolated check dam of unknown age. None of these sites are currently listed in the NRHP; however, all should be considered potentially eligible for listing until further work is done to evaluate their eligibility.

Site density varies directly with the intensity of survey, with greater number of sites located in the areas more intensively surveyed. Fourteen of the 27 known sites are located on the descent of the Sierrita Mountains west of Sahuarita and Green Valley, 2 are located near the intersection of the Crossover Corridor and Sopori Wash, and the remaining 11 are located on the Coronado National Forest. The majority of the sites on the Coronado National Forest are located along Peck Canyon. Data collected from AZSITE indicate that less than 15 percent of the Crossover Corridor has been previously surveyed for cultural resources. The area around Sahuarita and a portion of the eastern descent of the Sierrita Mountains west of Green Valley represent the majority of previously surveyed land. Because only a small percentage of the Crossover Corridor has been previously surveyed for cultural resources, it is extremely likely that additional prehistoric and historic sites exist within the corridor. Based upon the varied terrain of the Crossover Corridor, a wide range of archaeological site types are expected. Prehistoric and historic habitation sites are commonly located along river and wash corridors, whereas the mountainous segment may contain Native American rock art sites and shrines, as well as Historic Period ranching and mining related sites.

3.4.1.4 *115-kV Interconnection of the Gateway and Valencia Substations*

To date there has been no review of inventoried cultural resource sites in the vicinity of the proposed 115-kV Gateway and Valencia Substations interconnection. The 115-kV interconnection route has been moderately developed and significant cultural resources are not expected.

3.4.2 Native American Concerns

The proposed project is within the traditional territories of 12 Native American tribes. Four of these tribes are culturally closely related, all speak O'Odham, and work closely together in cultural resources consultation; they are referred to here as the "Four Southern Tribes" and are the Ak-Chin Indian Community, Gila River Indian Community, Salt River Pima-Maricopa Indian Community and the Tohono O'Odham Nation. Culturally, the Four Southern Tribes are also referred to as "O'Odham" which is their name for themselves, as well as their language, and literally means "people."

3.4.2.1 *Consultation Conducted*

DOE initiated formal government-to-government consultation in a November 20, 2001, letter (DOE 2001b) sent to tribal governments of the 12 Native American communities/tribes/nations that are likely to have traditional concerns in the area: the Ak-Chin Indian Community, Fort Sill Apache Tribe, Gila River Indian Community, Hopi Tribe, Mescalero Apache Tribe, Pascua Yaqui Tribe, Salt River Pima-Maricopa Indian Community, San Carlos Apache Tribe, Tohono O'Odham Nation, White Mountain Apache Tribe, Yavapai Apache Nation, and the Pueblo of Zuni (listed in Table 3.4–1). Seven of the 12 tribes contacted have indicated to DOE representatives that they have concerns about the proposed project and that portions of the project's Area of Potential Effect (APE) are important to them. These include the Four Southern Tribes, the Hopi Tribe, the Mescalero Apache Tribe, and the Pascua Yaqui Tribe. Consultation is ongoing with all tribes, but the O'Odham tribes and Pascua Yaqui have communicated their concerns in several meetings as well as during site visits on January 23, 2002 and February 4, 2003 (SWCA 2002c). Representatives of the Tohono O'Odham Nation have also met directly with DOE representatives in Washington, DC, to discuss their cultural concerns. Concerns discussed during these site visits and in meetings are presented in Section 3.4.2.2.

Table 3.4–1. Tribal Officials Contacted by DOE in Project Scoping.

Tribe	Name	Title
Ak-Chin Indian Community	Mrs. Delia Carlyle[a]	Chairperson
	Ms. Elaine Peters	Ak-Chin Him Dak Museum Director
	Mr. Jon Shumaker[b]	Tribal Archaeologist
Fort Sill Apache Tribe	Mrs. Ruey Darrow[c]	Chairperson
	Mr. Michael Darrow	Tribal Historian
Gila River Indian Community	Mr. Donald Antone	Governor
	Dr. John Ravesloot	CulturalResources Coordinator
	Mr. Barnaby Lewis[d]	Cultural Resources Specialist
Hopi Tribe	Mr. Wayne Taylor	Chairman
	Mr. Leigh Kuwanwisiwma	Hopi Cultural Preservation Office Director
Mescalero Apache Tribe	Ms. Sara Misquez	President
	Ms. Donna Stern-McFadden	Tribal Historic Preservation Officer
Pascua Yaqui Tribe	Mr. Robert Valencia	Chairman
	Ms. Amalia Reyes	Language and Culture Specialist
Salt River Pima-Maricopa Indian Community	Mr. Ivan Makil[e]	President
	Mr. Ron Chiago[f]	Cultural Resources Coordinator
San Carlos Apache Tribe	Mr. Raymond Stanley[g]	Chairman
	Ms. Vernelda Grant	Director, Historic Preservation and Archaeology
	Mrs. Jeanette Cassa	Elders Cultural Advisory Council
	Mr. Seth Pilsk	Ethnobotanist, Assistant to Elders Advisory Council
Tohono O'Odham Nation	Mr. Edward Manuel	Chairman
	Mr. Tony Burrell[h]	Chairman, Cultural Committee
	Mr. Peter Steere	Cultural Affairs Program Manage
	Mr. Joe Joaquin	Cultural Resrouces Specialist and NAGPRA Coordinator
White Mountain Apache Tribe	Mr. Dallas Massey, Sr.	Chairman
	Mr. Ramon Riley	Cultural Resources Director
	Dr. John Welch	Tribal Historic Preservation Officer
Yavapai-Apache Nation	Mr. Aaron Russell	Chairman
	Mr. Don Decker	Director, Apache Cultural Program
Pueblo of Zuni	Mrs. Katherine Marquez	Director, Yavapai Cultural Program
	Mr. Malcolm Bowekaty[i]	Governor
	Dr. Jonathan Damp	Tribal Historic Preservation Officer

[a] Terry O. Enos replaced Delia Carlyle as Chairman in 2002.

[b] Jon Shumaker no longer is employed by the Ak Chin Indian Community (as of July 2002). Nancy Nelson is now Cultural Resource Manager and Deborah Baptisto is Cultural Resources Specialist. Both have been consulted with on this project to follow up previous work with Jon Shumaker.

[c] Ruey Darrow is deceased (2002); current chairperson is Jeff Houser.

[d] Angela Garcia is now assistant cultural resources specialist and is assisting Barnaby Lewis with consultation on this project, as are other staff members.

[e] Ivan Makil is no longer President of the Community; Joni Ramos is the current President (2003).

[f] Mr. Chiago is no longer Cultural Resource Manager for the Salt River Pima Maricopa Indian Community. Other staff members, specifically Mr. Gary Gilbert, are communicating the Community's concerns on this project.

[g] Raymond Stanley is no longer Chairman; Kathleen Wesley-Kitcheyan was elected Chairwoman in Fall 2002.

[h] Tony Burrell is no longer on the Legislative Council and no longer serves as Chairman of the Cultural Preservation Committee. Mary Flores is now Chair of the Cultural Preservation Committee, and further consultation has been conducted with her, as well as other committee members: Felicia Nuñez, Jerome Joaquin, Emilio Lewis, and Frances Miguel.

[i] Malcolm Bowekaty is no longer Governor; Arlen Quetawki, Sr. was elected in Fall 2002.

The Hopi Tribe, on December 4, 2001, requested the opportunity to review both the project EIS and all archaeological inventories prepared for this project (SWCA 2002c). Mescalero Apache Tribe representatives have also stated that they would like to consult further on this project and that they hope to set up a meeting and site visit with USFS Coronado National Forest (SWCA 2002c). The Four Southern Tribes Consulting Group requested further site visits and presentations on the project, and they wish to review all project documents, including all archaeological and cultural resource reports, the Draft and Final EIS, as well as any biological reports prepared that may present information about plants and animals traditionally used by the O'Odham. The Pascua Yaqui Tribe also wishes to be included on future site visits and to review cultural resource reports and the Draft EIS and Final EIS. Dates are pending for continued consultation between the Mescalero and DOE and cooperating agencies, as well as between the O'Odham and DOE and cooperating agencies.

3.4.2.2 *Cultural Concerns and Traditional Cultural Properties*

Traditional cultural information is often confidential and sensitive, and many tribal representatives are reluctant to divulge information about traditional localities. A lack of response to tribal notification should neither be interpreted as a lack of concern nor an indication that there are no sensitive localities within the proposed project area. The Coronado National Forest has provided a very useful summary of the published literature on O'Odham use of the Forest through which portions of the three proposed corridors would cross (USFS 2002d). This document details the ethnography, occupation, and traditional O'Odham uses of the Tumacacori Uplands region (region including Tumacacori and surrounding higher ground, see Figure 1.1–4), and also references the Apache and Yaqui presence in the Tumacacoris during historic times. O'Odham plant use and the kinds of landmarks that are culturally significant to traditional O'Odham are also very well summarized in this document, and together this provides valuable background for assessing the potential cultural impacts to USFS land in this project.

An issue of concern to all responding tribes is the possibility that project construction would disturb previously undiscovered human remains (SWCA 2002c; USFS 2002d). Procedures for consultation with the tribes regarding unavoidable or unanticipated disturbance of human remains and funerary objects located on non-Federal land in Arizona are specified in amendments to the *Arizona Antiquities Act* (Arizona Revised Statutes [ARS] §41-844 and §41-865). Any remains located on Federal land are subject to the provisions established by NAGPRA, and procedures for handling any discoveries would be specified in a project Memorandum of Agreement and Plan of Action. No discoveries of human remains are expected on this project because care would be taken to minimize archaeological site disturbance through careful location of project facilities.

A second issue of concern is the disturbance of localities or natural features named in traditional stories, the "Cultural Landscape." Some of these localities may also serve as shrine or ritual sites and may still be in use. To date, none of the tribes consulted have identified or named specific localities, natural features, or other landscape features that may be affected by this project, beyond the suggestion that protohistoric O'Odham villages may be impacted (SWCA 2002c). The known locations of these villages are not in any of the proposed project corridors (SWCA 2002c; USFS 2002d) and efforts would be made to identify any previously unknown villages that are located within the proposed corridors. Furthermore, none of the tribes consulted have yet identified stories or oral traditions that may relate to the project area (SWCA 2002c; USFS 2002d). That stated, individual communities often have local interpretations of landscape features, and these sometimes "place widely known creation-time events at local landmarks" (USFS 2002d); only further discussion with American Indian elders is likely to identify oral traditions identifying local landmarks.

Third, a great concern to most responding groups is the natural landscape of the Western Corridor (SWCA 2002c). Because there has been minimal disturbance to this area, the tribes believe that there may

be many previously unrecorded archaeological features within the route's APE, as well as culturally significant plants and animals (SWCA 2002c, USFS 2002d). The undisturbed nature of the Western Corridor is significant to the tribes because it is one of the few areas still existing in southern Arizona where the pre-European contact landscape can be encountered (SWCA 2002c).

The consulted Native American groups recommend avoiding the Western Corridor entirely. They believe construction of the proposed transmission line (including the ROW and access roads) has the potential both to reveal cultural resources (prehistoric, historic, or modern) and to adversely impact such resources. Avoidance of both known and newly discovered cultural resources is the mitigation recommended by all responding Native American tribes to date; however, if avoidance is not possible, it would be necessary to develop and implement plans to mitigate potential adverse effects. The O'Odham representatives request that these mitigation plans include both archaeological recovery and an ethnographic cultural landscape study. This evaluation of the cultural landscape would include interviews with elders to enhance the inclusive analyses of geographic landscape features and archaeological/historical data using a geographic information system (GIS) mode of analysis to portray the links between landscape and cultural features.

O'Odham. As described previously, the O'Odham are represented by four modern tribes: the Ak-Chin Indian Community, Gila River Indian Community, Salt River Pima-Maricopa Indian Community, and the Tohono O'Odham Nation. The eastern boundary of the main portion of the Tohono O'Odham Nation is approximately 27 mi (43 km) west of the intersection of the Western Corridor and Arivaca Road (Figure 3.1–1). The southern boundary of the San Xavier District of the Tohono O'Odham Nation, which is not contiguous with the main reservation, is approximately 1.0 mi (1.6 km) north of all three project corridors as they exit the South Substation. The area of O'Odham traditional land use extends east of the Tohono O'Odham Nation boundary across the Santa Cruz and San Pedro River Valleys, and almost to the New Mexico border. All alternative corridors for the project are within O'Odham traditional lands (SWCA 2002c), and the Tohono O'Odham Nation is taking the lead in consultation on behalf of other O'Odham groups because of the proximity of the project to the Tohono O'Odham Nation.

The Tohono O'Odham Nation regards the lands involved in the proposed transmission line corridors as "culturally sensitive since they contain many significant cultural sites including traditional cultural places, archaeological sites, sacred sites, religious sites, plant collection areas for basket materials, and medicines and burial sites" (SWCA 2002c). Background research on the area, though not identifying any specific localities, also suggests that such culturally sensitive localities may occur within the proposed corridors (USFS 2002d). The Tumacacori Uplands support a number of plant taxa that were traditionally important to the O'Odham and many of these are relatively rare in the desert lowlands to the west and north where the majority of O'Odham reservation land is located (SWCA 2002c, USFS 2002d). These taxa include but are not limited to: oaks (*Quercus*), agaves (*Agavaceae*), banana yucca (*Yucca baccata*), beargrass (*Agave schottii)*, walnuts (*Juglans nigra)*, mulberry (*Morus)*, chiltepines (*Capsicum annuum* var.*glabriusculum*), and sayas (*Amoreuxia sp*.) (USFS 2002d). Specific information about the location of such places or resources has not yet been provided to DOE by the Tohono O'Odham Nation.

Of the known archaeological sites described in the previous section, none are identified as sacred sites, religious sites, or burial sites (SWCA 2002c, USFS 2002d). Peaks, caves, shrines, burials, rock art sites, and sacred object caches have been recognized as culturally important places to the O'Odham within the greater region (USFS 2002d). Some of these types of places (rock art sites, caves) are present in the Tumacacori Uplands, but their specific cultural significance has not been established (SWCA 2002c, USFS 2002d). Archaeological sites within O'Odham traditional lands are important to the preservation of O'Odham heritage because the sites are the remains of their ancestors (SWCA 2002c, USFS 2002d). Burial areas are considered shrines (SWCA 2002c). Traditionally, rock art panels and *tinajas* (rock tanks in which rain water collects) are also important sites; many are active shrines that are not disclosed to

outsiders. The area known as Tinajas Hills near the Western Corridor and the Sierrita Mountains is particularly important to the O'Odham (SWCA 2002c).

Although archaeological remains are very significant to the O'Odham, they also place high regard and value on native plants and animals, and the natural landscape of their traditional use area (SWCA 2002c, USFS 2002d). All native plants and animals are linked and considered significant in O'Odham tradition (SWCA 2002c, USFS 2002d). "Many authors have noted the close connection between O'Odham religion and the landscape they live in" and "every part of the natural environment is also personified and must be treated with circumspection and respect" (USFS 2002d). O'Odham representatives stated that they do not want plants and animals affected by this project, but they have not yet named species or specific locations in the project areas other than National Forest System lands. The preservation of relatively undisturbed landscapes similar to those used by the O'Odham prior to European contact is important to the O'Odham, especially in areas where people traditionally collected subsistence foods and lived in villages (SWCA 2002c). According to the NRHP, eligibility of such an ethnographic landscape that does "not contain, or connect, specific special places or landmarks is tenuous at best" (USFS 2002d). Nevertheless, the Tohono O'Odham Nation's preference for undisturbed landscapes gives added weight to the general visual quality concerns.

The Tohono O'Odham Nation is also concerned about the cumulative impacts to both "the cultural and physical landscapes and view sheds of the proposed transmission line corridors, including possible impacts to National Forest System lands; the Pajarita Wilderness Area, the Goodding Research Natural Area, the riparian zones in Sycamore Canyon and many unique plant and animal species found in the area" (SWCA 2002c). The Pajarita Wilderness, Goodding Research Natural Area, and Sycamore Canyon are shown in Figure 3.1–1.

Tohono O'Odham representatives were consulted about a specific published passage regarding the effects of constructions (such as power lines) that disrupt the space between significant landmarks, and thus disrupt the forces that hold the earth together (quoted in USFS 2002d, SWCA 2002c). The issue of disruption of space must be considered from the standpoint of the American Indian Religious Freedom Act (AIRFA; Public Law 95-341, enacted in 1978), Executive Order 13007 signed in 1996, and the First Amendment to the Constitution of the United States of America.

All issues raised concerning NHPA, AIRFA, as well as all relevant EOs are being evaluated during this NEPA process. Following the ROD, mitigation would be identified as part of ongoing tribal consultation.

Tohono O'Odham representatives, speaking on behalf of the four Southern Tribes, have stated that they oppose the Western Corridor because it would affect a relatively pristine area and it may also affect archaeological sites and possibly culturally-sensitive sites as well (SWCA 2002c). No specific traditional cultural properties (TCPs) have been identified along the proposed corridors to date. All comments have been made during telephone conversations, meetings, site visits, or in a submitted letter (SWCA 2002c).

Pascua Yaqui. The Pascua Yaqui have deep ties to both the Western and Central Corridors because these areas were used by their ancestors during their wide-ranging food-gathering excursions in the distant past. More recently, during the 1889-1921 Mexican Wars (sometimes referred to as the "Yaqui Wars"), direct ancestors of the Pascua Yaqui traveled through this corridor of land between Nogales and Tucson as they fled political persecution. Traveling near and along the Santa Cruz River, the Yaqui refugees-turned-immigrants also transported guns and ammunition to their relatives struggling against the Mexican government. Many of these refugees bore wounds, and it is likely that some died and were buried in the countryside. The Pascua Yaqui Tribe considers these Yaqui burials and campsites as TCPs. During consultation on this project, Yaqui representatives stated that some TCPs may be located along project corridors, but none have been specifically identified to date (SWCA 2002c). If any are

encountered in the project area, these sites must be evaluated for inclusion in the NRHP and discussed as part of compliance with the NHPA.

No specific Yaqui TCPs have yet been identified along this or any of the proposed corridors by representatives of the Pascua Yaqui tribe. All comments from the Pascua Yaqui tribe have been made during telephone conversations or the January 2002 site visit.

Hopi. The Hopi view archaeological sites as proof of their oral traditions, specifically as evidence of their Covenant of Natwani. Sacred Hopi oral traditions describe migrations of many clans to the Hopi mesas from all directions prior to the arrival of Euro-Americans in Arizona. A distinct and significant area named in Hopi traditional history is referred to as Palatkwapi, located to the south of present-day Hopi reservation. Some believe that Palatkwapi is in southeastern Arizona. Because of the importance of archaeological remains to Hopi culture and religion, the Hopi wish to be informed about any disturbances to archaeological materials or human remains encountered on the proposed project. Hopi representatives have stated that all archaeological sites eligible for the NHRP are of cultural importance and are potentially Hopi TCPs. To date, the Hopi tribe has not specifically identified any Hopi TCPs within the proposed project area. All comments have been made in either telephone calls or in the submitted letter (SWCA 2002c).

Apache and Yavapai. The Fort Sill Apache Tribe, San Carlos Apache Tribe, White Mountain Apache Tribe, and Yavapai-Apache Nation have not yet stated their cultural concerns in response to requests for consultation, nor have they expressed their intention to consult on this project. The Mescalero Apache Tribe wishes to consult on this project because it is concerned about the project's impacts on their heritage sites (SWCA 2002c).

Zuni. No concerns have been stated.

3.5 SOCIOECONOMICS

This section describes current socioeconomic conditions within a region of influence (ROI) where the majority of the Tucson Electric Power Company (TEP) Sahuarita-Nogales Transmission Line Project workforce is expected to reside, including the Gateway to Valencia Substations interconnection area, based on proximity to the proposed corridors and historic employment patterns. The ROI is a two-county area in Arizona comprised of Pima and Santa Cruz Counties (see Figure 1.1–3). The ROI covers an area of 10,424 mi^2 (26,998 km^2) around the proposed corridors (Census 2000a, 2000b). The ROI would be the same, regardless of the project alternative selected, because the workforce required to construct each alternative is expected to reside within these two counties.

3.5.1 Population and Housing

The City of Tucson comprises a small portion (223 mi^2 [577.6 km^2] or 2.4 percent) of Pima County, yet is home to the majority of the population (57.6 percent) in the county (Census 2000c, Tucson 2001). The majority of Pima County outside of Tucson and all of Santa Cruz County are largely rural in character. Over the last 40 years, the population of Arizona has grown at an extremely accelerated rate, and has nearly quadrupled in number. Though the ROI has not experienced quite the same level of population growth as the state, the ROI has also experienced a high rate of population growth with the population more than tripling over the past 40 years. During the 1990s, Arizona's population increased by 40 percent, while the population of the ROI increased by 26.6 percent. Future population predictions show that the rapid population growth throughout Arizona is expected to continue in the near future. The population of the ROI is expected to grow at a higher rate than the state, 22.2 percent compared to 19.8 percent, over the next 10 years. Table 3.5–1 presents the historic and projected populations in the ROI and the state.

Table 3.5–1. Historic and Projected Population

	1960	1970	1980	1990	2000	2010
Pima County	256,660	351,667	531,443	666,880	843,746	1,031,623
Santa Cruz County	10,808	13,966	20,459	29,676	38,381	46,246
ROI (Pima and Santa Cruz)	267,468	365,633	551,902	696,556	882,127	1,077,869
Arizona	1,302,160	1,770,900	2,718,215	3,665,228	5,130,632	6,145,108

Source: Census 2000a, 2000b.

Tucson is the largest city in the ROI with a population of 486,699 in the year 2000. Other cities include Green Valley in Pima County, with a population of 17,283 in 2000, and Nogales and Rio Rico in Santa Cruz County with populations of 20,878 and 10,413 in 2000 respectively (Census 2000c).

Table 3.5–2 presents housing characteristics in the ROI. There was a total of 379,773 housing units in the ROI in 2000.

In 2000, the median value of owner-occupied housing in the ROI was $85,000 in Santa Cruz County and $154,000 in Pima County. In 2000, median monthly rent was $475 in Santa Cruz County and $544 in Pima County. The rental vacancy rate in the ROI is equivalent to the state level of 9.2 percent. Based on the number of occupied rental units and the vacancy rate in the ROI, over 12,000 rental units are estimated to be currently vacant (Census 2000b).

Table 3.5–2. Region of Influence Housing Characteristics

	Total Number of Housing Units	Number of Owner-Occupied Units	Owner-Occupied Vacancy Rates	Median Value	Number of Occupied Rental Units	Rental Vacancy Rates
Pima County	366,737	213,603	1.8%	$154,000	118,747	9.2%
Santa Cruz County	13,036	11,809	2.1%	$85,000	3,783	8.2%
ROI (Pima and Santa Cruz)	379,773	225,412	1.8%	NA	122,530	9.2%
Arizona	2,189,189	1,293,556	2.1%	NA	607,771	9.2%

Source: Census 2000c.

3.5.2 Employment and Income

Employment by sector over the last decade has changed slightly, as shown in Table 3.5–3. The services sector provides the highest percentage of the employment in the ROI, with 34.5 percent, followed by the wholesale and retail trade and government sectors with 21.2 percent and 17.9 percent, respectively. Farm employment has decreased over the last decade, providing 0.4 percent of employment in 1990 but only 0.3 percent in 1997 (BEA 1999). Table 3.5–3 presents employment levels for the major sectors of the ROI economy.

Table 3.5–3. Employment by Sector (Percent)

Sector	1990	1997
Services	32.2	34.5
Wholesale and retail trade	22.2	21.2
Government and government enterprises	18.0	17.9
Manufacturing	8.7	7.6
Construction	5.8	6.1
Finance, insurance, and real estate	7.6	6.4
Transportation and public utilities	3.3	4.2
Farm employment	0.4	0.3
Mining	0.8	0.7
Other Sectors	1.0	1.2

Source: BEA 1999.

The ROI experienced slight changes to the labor force throughout the late 1990s. The labor force decreased from 399,475 in 1995 to 397,175 in 2000, a 5-year growth rate of -0.6 percent. Employment experienced growth despite the decline in the labor force, increasing from 383,725 in 1995 to 384,425 in 2000, a 5-year growth rate of 0.2 percent. The ROI unemployment rate was 3.9 percent in 1995, falling to 3.2 percent in 2000, as shown in Table 3.5–4. Santa Cruz County experienced a large decrease in its unemployment rate during this period, with the rate dropping from 19.6 percent in 1995 to 13.8 percent in 2000. The average unemployment rate for the State of Arizona was 3.9 percent in 2000 (ADES 2001).

Per capita income in the ROI was $26,248 in 1999, more than a 19 percent increase from the 1995 level of $22,013. Per capita income was $20,855 in Santa Cruz County and $26,440 in Pima County. The per capita income in Arizona averaged $28,807 in 1999, while the U.S. average was $32,109 (CBP 1995a, 1995b, 1999a, 1999b, 1999c, 1999d).

Table 3.5–4. Region of Influence Unemployment Rates (Percent)

	1995	2000
Pima County	3.3	2.8
Santa Cruz County	19.6	13.8
ROI Total (Pima and Santa Cruz)	3.9	3.2
Arizona	5.1	3.9

Source: ADES 2001.

3.5.3 Community Services

This subsection presents the availability of community services in the project's ROI. Tucson is located approximately 15 mi (24 km) north of the northern end of the proposed project and large fire and police services associated with major metropolitan areas can be found there. Other fire and police stations are located along the various routes analyzed. In Pima County, there are 13 police stations and 24 fire stations, and in Santa Cruz County, there is one police station and 7 fire stations.

There are approximately 45 school districts serving the ROI, with the majority of them located in the Tucson metropolitan area in Pima County. These districts utilize over 7,200 teachers to educate over 139,000 students (EDU 2001a, 2001b). There are also 37 private schools in the ROI educating approximately an additional 9,800 students (EDU 2001c, 2001d). There are a number of institutions of higher learning in the ROI, including the University of Arizona, the University of Phoenix-Tucson Campus, Tucson University, and Pima Community College.

Although public transportation services exist in Pima and Santa Cruz counties, workers would not be able to take public transportation to construction staging areas.

Thirteen major hospitals are located in the ROI, 12 in Tucson and 1 in Nogales. There are 2,532 beds in these hospitals and over 2,500 physicians throughout the ROI (AHA 1995, AMA 1995). The majority of the hospital beds and physicians are located in the city of Tucson in Pima County.

3.5.4 Revenues for Forest-Based Activities

Revenues generated from activities on Federal lands are shared with local governments through various regulations, including the *25 Percent Fund Act* (Public Law 60-136) and Payments in Lieu of Taxes (PILT) (Public Law 94-565, Public Law 97-258). The majority of the revenues are generated by timber sales; however, mineral resources, grazing fees, and recreation also contribute to the total revenue generated by National Forest System land. In 1997, USFS, through the 25 Percent Fund, paid the State of Arizona $2,214,865, of which $43,676 and $46,815 were paid to Pima and Santa Cruz Counties respectively. Additionally, PILT payments totaling $9,439,156 were made to Arizona during 1997, including $954,001 to Pima County and $305,255 to Santa Cruz County. This total does not include payments made through the Minerals Management Service of the Department of the Interior.

Recently, these laws were amended by the *Secure Rural Schools and Community Self Determination Act* of 2000 (Public Law 106-393). Counties that have received payments previously are now eligible to collect either the traditional amount (usually 25 percent for USFS land) or an amount equal to the average of the three highest years' payments between 1986 and 1999. If the latter amount is requested (referred to as the "full payment"), the counties must use 80 to 85 percent of the total for traditional payments to support roads and schools (the percentage depends on the total amount received). The balance of the payment would be used for public land projects or county-level projects as determined by a resource advisory council in the local area. This new law went into effect for the fiscal year 2001 payments to states.

3.5.5 Tourism

Tourism in Arizona contributes approximately $16 billion annually in direct visitor spending, and approximately $30 billion annually in total direct economic impact. Arizona's natural tourist attractions (e.g., outdoor parks and recreation areas) were visited by approximately 17.5 million people in 2002, compared with 11.5 million visitors to other tourist attractions within the state. The Coronado National Forest was Arizona's fifth most popular natural tourist attraction in 2002, with approximately 1.5 million visitors, about 9 percent of the state's total visitors to natural tourist attractions (AZOT 2002).

The Arizona State Parks Draft 2003 Statewide Comprehensive Outdoor Recreation Plan Outdoor Recreation Analyses indicates a general increasing trend in outdoor recreation in Arizona, by both Arizona residents and visitors on vacations (SCORP 2003). In particular, the University of Arizona's Department of Agriculture has stated that ecotourism offers a very "promising niche market for rural areas in Arizona" because "an economic study in Southeastern Arizona showed that nature tourists spent more money on average than other types of visitors to the area" (AREC 2004).

Much of the existing tourism in the project area is ecotourism in the form of bird-watching ("birding"). Southern Arizona is a very popular destination for birding because the "year-round temperate climate and diverse habitats combine to attract hundreds of bird species seasonally" (Birding 2004).

Specifically within the Coronado National Forest, USFS collects fees for Special Use Permits issued for a wide range of activities, including outfitter and guide operations that cater to tourists who seek outdoor activities. The destination of a majority of visitors to the Tumacacori EMA is Peña Blanca Lake Recreation Area. See Section 3.5.4 for further discussion of recreational revenues for Forest-based activities.

3.6 GEOLOGY AND SOILS

This section describes the existing geologic and soil environment in the vicinity of the proposed project. Discussions of geology and soils that apply to all three proposed corridor are followed, respectively, by information specific to the Western, Central, and Crossover Corridors.

3.6.1 Geology

The proposed project area is located within the Basin and Range Physiographic Province that is characterized by alternating mountain ranges and broad valleys, most of which were formed by block faulting during the last part of the Cenozoic Era, 5 to 15 million years ago (NRCS 2001).

Elevations in the vicinity of the three proposed corridors range from 2,675 ft (815 m) above mean sea level (AMSL) at the South Substation to the high point in the Coronado National Forest of 6,244 ft (1,903 m) AMSL at the Atascosa Fire Lookout. The elevation at the U.S.-Mexico border is 4,085 ft (1,245 m) AMSL. Ground slope within the Tumacacori Ecosystem Management Area (EMA) varies from nearly flat to over 40 percent, with over half the land at 15 to 40 percent slope, and steeper slopes within the Tumacacori and Atascosa Mountains (USFS 2001b).

Several geologic units are present along the three proposed corridors, such as unconsolidated sediments (surficial alluvium deposited by running water), sedimentary rock, and volcanics (Figure 3.6–1). The unconsolidated sediments include young alluvium and older surficial deposits. The young alluvium consists of sediments carried from the mountains and deposited in present-day rivers and stream channels, floodplains, and playas. The older surficial deposits consist of alluvial and aeolian (wind-deposited) deposits found in present-day valleys and piedmonts (bases of mountains).

Geologic Resources. As is common in many areas of Arizona, the Santa Cruz Valley contains abundant geologic resources, including copper, molybdenum, silver, and gold, that are mined along the common northern segments of the three proposed corridors.

Sand and gravel mining operations do not occur within the three proposed corridors, and there are no significant coal or oil and gas resources in the immediate area. Inactive mine tailing areas are located adjacent to the common northern segments of the three proposed corridor west of Sahuarita, in Township 17 South, Range 13 East.

Geologic Hazards. The geologic hazards that could affect the project include faults and seismic activity, and ground failures such as slumping, landslides, debris flows, and subsidence causing ground fissures.

Faults and Seismic Hazards. In order to assess earthquake hazards, historical earthquakes are described and faults along which movement has occurred in the past 2 million years (the Quaternary Period) are mapped and characterized. The historical record of earthquakes in Arizona dates to about 1776, but records are sparse prior to the late 1800s. The following discussion of earthquake hazard is primarily summarized from an Arizona Geological Survey publication, *Arizona Geology* (Arizona 2000).

Since 1850, over 20 earthquakes with magnitudes greater than 5 on the Richter Scale have occurred in or near Arizona. A table of the Richter scale and its description is shown in Table 3.6–1. Most earthquakes have occurred in northern Arizona and in California, adjacent to the southwest corner of Arizona. The largest earthquake recorded in the region was the magnitude 7.4 (on the Richter Scale) Sonoran earthquake of 1887. It was centered about 125 mi (205 km) southeast of Sahuarita, and caused 51 deaths in Sonora and extensive property damage throughout southeastern Arizona. The fault that generated the 1887 Sonoran earthquake probably had not caused a similar earthquake for at least 100,000 years (Arizona 2000).

Table 3.6–1. Richter Scale

Magnitude	Descriptor
Less than 3.0	Very minor-generally not felt
3-3.9	Minor-generally felt, no damage
4-4.9	Light-felt widely, slight damage near epicenter
5-5.9	Moderate-damage to poorly constructed buildings
6-6.9	Strong-can be destructive in areas up to approximately 100 km across where people live
7-7.9	Major-can cause serious damage over larger areas
8 and higher	Great-can cause serious damage in areas several hundred km across

Source: Richter 2003, USGS 2003.

Potentially active faults that could generate magnitude 6.5 to 7.2 earthquakes are scattered throughout southeastern and central Arizona, including much of the Phoenix and Tucson areas. Earthquakes of this magnitude are considered to be destructive to major ones. All of the potentially active faults in the Phoenix and Tucson areas have low slip rates, long intervals between ruptures, and have had little historic activity. Because of this, the Arizona Geological Survey places these areas in the low to moderate hazard category.

Slumping, Landslides, and Debris Flows. Almost any steep or rugged terrain is susceptible to slope failure under certain conditions. Flash floods, however, can occur in the numerous narrow washes that cross the valley floor of the proposed project area.

Subsidence. Extensive and long-term groundwater withdrawal can in some areas cause ground subsidence. Over time, this can lead to ground fissures given the right geologic conditions. This geologic hazard is a concern in the Tucson area and areas north of Tucson, as substantial ground subsidence with resultant fissures has occurred in these areas of Arizona. Subsidence hazards have not been documented along the three proposed corridors, and are therefore not expected.

3.6.1.1 *Western Corridor*

As part of the analysis of roads required by the Forest Service (USFS), Terracon conducted a geotechnical evaluation of the proposed project area on the Coronado National Forest (Terracon 2002). Relatively intact bedrock is near to or exposed at the ground surface along the majority of the Western Corridor on the western side of the Tumacacori Mountains, as shown by the areas of tertiary conglomerate and sandstone in Figure 3.6–2 on national forest land (Terracon 2002). The photograph in Figure 3.6–3 shows exposed bedrock along the Western Corridor. The bedrock would be suitable for supporting poles on a rock bolted base, in which small holes are drilled into the bedrock and the tower is attached with large bolt, as described in Section 4.6, Geology and Soils.

Areas of the Western Corridor that are relatively flat (much of the northern half of the corridor) may be considered too flat to be affected by mass movements such as slumping, landslides, and debris flows. The terrain along the Western Corridor has relatively mild slopes, except where it crosses occasional drainages and steep mountain slopes (Terracon 2002). The mountainous areas of the Western Corridor, primarily located in the Coronado National Forest, can be considered areas where mass movements could occur. The U.S. Geological Survey (USGS) has mapped much of the Coronado National Forest as general areas susceptible to debris flows, although none have been documented in the project area (USGS 1999).

Castle Rock is a prominent topographical feature at the edge of the Western study corridor south of Peña Blanca Lake (as shown in Figure 3.2–2). TEP's preliminary siting of the 125-ft (38-m) right-of-way (ROW) avoids this rocky outcrop.

Figure 3.6–3. Exposed Bedrock Along the Western Corridor.

3.6.1.2 *Central Corridor*

A majority of the Central Corridor near and on the Tumacacori EMA has exposed soil at the surface rather than bedrock, as depicted by areas of Quaternary alluvium in Figure 3.6–1, and as shown in Figure 3.6–4. The foundations for towers along the Central Corridor in these exposed soil areas would most likely require embedment poles, as described in Section 4.6, Geology. The terrain along the Central Corridor is generally defined by a series of hills separated by washes (Terracon 2002). There are no meaningful differences in geology between the Option 1 and 2 sub-routes for either the Central Corridor or the Crossover Corridor.

3.6.1.3 *Crossover Corridor*

The discussion of geology for the Western and Central Corridors also applies to the Crossover Corridor in segments where these corridors overlap. Where the Crossover Corridor passes through Peck Canyon for approximately 7 mi (11 km), the majority of the land has bedrock exposed at the surface. The terrain along Peck Canyon is rough and jagged, with steeply sloping canyon walls and a narrow winding canyon bottom (Terracon 2002).

3.6.1.4 *115-kV Interconnection of the Gateway and Valencia Substations*

The proposed interconnection would be located within the northwestern portion of the City of Nogales. The topographic character within and surrounding the proposed interconnection route can be characterized as

scattered foothills. Geologic units present are unconsolidated alluvial sediments and sedimentary rock. None of the area is actively mined for any geologic resource.

3.6.2 Soils

This section describes the existing soil environment in the vicinity of the proposed project. Depending on the type of soil present in each proposed corridor, foundations used in the area would differ as described in Section 4.6, Geology and Soils.

Figure 3.6–4. Exposed Soil Along the Central Corridor.

Soil Map Units. The three proposed corridors would cross five soil associations, as mapped by the Natural Resources Conservation Service (NRCS) and shown in Figure 3.6–5. None of the soils identified have any characteristics that would present any obstruction to standard construction techniques. Brief summaries of the soil associations in the corridors are provided below (USDA 1979).

Comoro-Pima Association. This soil association consists of well-drained sandy and clay loams (an easily crumbled mixture of clay and sand) to a depth of 60 in (152 cm) or more. These soils are on floodplains with slopes ranging from 1 to 3 percent and alluvial fans (fan-shaped deposits that are dropped by a stream) with slopes from 1 to 10 percent. The permeability (quality of soil that enables water or air to move through it) is moderate to rapid. The soil erosion hazard is generally slight, but soils in narrow drainages can be susceptible to gully erosion. Soils in floodplains can be subject to seasonal flooding.

Continental-Sonoita Association. This soil association consists of well-drained gravelly sandy loams to a depth of 60 in (152 cm) or more. Continental soils are typically found on older alluvial fans and terraces with slopes ranging 1 to 15 percent. Sonoita soils are found on reworked fan remnants with slopes typically ranging from 1 to 20 percent; although some short terrace breaks (raised embankment with a leveled top) have slopes as great as 45 percent. Permeability is moderately slow to moderate. The erosion hazard is generally slight in the different series comprising this association. The exception is the gravelly loams of the Rillino Series. These soils occur on the ends and sides of long narrow ridge remnants of dissected alluvial fans where runoff is rapid, and the erosion potential is high.

Bernardino-White House-Hathaway Association. This soil association consists of deep gravelly clay loams, gravelly sandy loams, gravelly loams, or clays to a depth of 60 in (152 cm) or more. This soil association is typically found on fans or piedmont plains (formed at the base of mountains) with slopes ranging from 0 to 45 percent. The erosion hazard is generally slight to moderate, except in two series that occur on steep slopes on either long, narrow sides of ridges or on strongly dissected upper old alluvial fans.

Caralampi-White House-Hathaway Association. This soil association consists of deep gravelly loams or gravelly sandy loams to a depth of 60 in (152 cm) or more. This soil association is typically found on dissected fans and piedmonts with slopes ranging from 10 to 60 percent. Permeability is moderate or slow. The erosion hazard is slight to high, and is primarily dependent upon slope, with the steeper slopes and vertical scarps (a line of cliffs produced by faulting or erosion) posing a higher erosion potential.

Lampshire-Chiricahua-Graham Association. This soil association consists of very cobbly (coarse) loams, very cobbly clay loams, or cobbly sandy loams with shallow to very shallow depths. Lampshire soils are 4 to 20 in (10 to 51 cm) deep and occur on mountains. Chiricahua are 20 in (50 cm) deep and are found on foothills and low mountains. Graham Soils are 10 to 20 in (25 to 51 cm) deep and on lower parts of mountains. Slopes range from 0 to 60 percent. Permeability above bedrock (solid rock beneath loose surface material) is moderate or slow. The erosion hazard is primarily slight to moderate, but is high on some steep slopes in the Atascosa and Tumacacori Mountains.

Prime Farmland. The NRCS has designated certain soil types as "prime farmland" subject to protection under the *Farmland Protection Policy Act.* Soils that are classified as prime farmland derive their value from their general advantage as cropland due to soil and water conditions. These soils are best suited for producing food, feed, fiber, forage, and crops. They have favorable growing seasons and receive sufficient quantities of moisture to produce yields on average of 8 out of every 10 years. The only soil types found in the corridors that are classified as prime farmland are the Comoro soil series (0 to 5 percent slope only, and referred to as Comoro soils in this document) and the Pima soil series. These soils are found within the Continental-Sonoita and Comoro-Pima soil associations, and are considered prime farmland only when irrigated.

Coronado National Forest Soil Classifications. USFS has classified the soil condition of the Tumacacori EMA, based on the vegetation, slope, and soil type combination, or on the watershed condition rating where the former were unavailable. Satisfactory soil condition indicates the current soil loss is below the tolerance level, and unsatisfactory soil condition indicates the current soil loss is above the tolerance level.

3.6.2.1 *Western Corridor*

The Western Corridor begins on the Comoro-Pima soil association and crosses the Bernardino-White House-Hathaway, Continental-Sonoita, and Lampshire-Chiricahua-Graham associations before separating from the Central Corridor. It continues on the Lampshire-Chiricahua-Graham association and crosses

areas of the Comoro-Pima and Continental-Sonoita associations before entering the Coronado National Forest.

On the Coronado National Forest, the Western Corridor crosses primarily the Lampshire-Chiricahua-Graham association, and crosses the Caralampi-White House-Hathaway association for the remainder of the route to Nogales. The Western Corridor passes through unsatisfactory soil conditions upon entering the Tumacacori EMA from the north, then passes through satisfactory soil conditions as it turns east at Ruby Road, and exits the Tumacacori EMA near Nogales again in unsatisfactory soil conditions (USFS 2001b).

In Santa Cruz County, the Western Corridor would cross approximately 1,900 linear ft (580 m) of prime farmland soils located in the far northwest corner of the county. These soils are Comoro soils and are grouped within the Continental-Sonoita soil association. These soils are found in the area of the Sopori and Batamote Washes and are considered prime farmland only when irrigated. Some of the area of Sopori and Batamote Washes are irrigated and farmed.

Specific locations of prime farmland soils in the corridors within Pima County have not been determined. Staff from the local NRCS office indicated that there are little, if any, prime farmland soils (when irrigated) in the project area of Pima County (NRCS 2003).

3.6.2.2 *Central Corridor*

After separating from the Western Corridor, the Central Corridor continues on the Lampshire-Chiricahua-Graham association, crosses a small area of the Comoro-Pima association, and continues on the Continental-Sonoita association to the Coronado National Forest boundary, as shown in Figure 3.6–4. The soils in the Central Corridor primarily consist of gravelly sands with a high percentage of cobbles and boulders (Terracon 2002).

On the Coronado National Forest, the Central Corridor (Options 1 and 2) crosses primarily the Caralampi-White House-Hathaway association, with a short section of the Lampshire-Chiricahua-Graham association just north of the crossing of Ruby Road. The Central Corridor passes almost entirely through unsatisfactory soil conditions, as described in Section 3.6.2.1, within the Tumacacori EMA (USFS 2001b).

In Santa Cruz County, the Central Corridor would cross approximately 5,600 linear ft (1,700 m) of prime farmland soils located near Amado and Tubac. Near Tubac, approximately 1,000 linear ft (305 m) of prime farmland soils would be crossed in the vicinity of Puerto Canyon and Tubac Creek. These soils are Comoro soils and are grouped within the Continental-Sonoita soil association. In the Amado area, approximately 4,600 linear ft (1,400 m) of prime farmland soils would be crossed in the area of the Toros, Sopori, Diablo, and Las Chivas Washes. These soils are Comoro soils (grouped within the Continental-Sonoita and Comoro-Pima soil associations), and Pima soils (within the Comoro-Pima association). All prime farmland soils within the project area are considered as such only when irrigated.

Specific locations of prime farmland soils in the corridors within Pima County have not been determined.

3.6.2.3 *Crossover Corridor*

The portion of the Crossover Corridor that is not common to one of the other corridors crosses primarily the Lampshire-Chiricahua-Graham association, plus a small area of the Caralampi-White House-Hathaway association. The Crossover Corridor passes almost entirely through unsatisfactory soil

conditions, as described in Section 3.6.2.1, except for the east-west crossing through Peck Canyon, where the soil conditions are satisfactory (USFS 2001b).

There are no prime farmland soils located within the Crossover Corridor, except for where it is common with the Western Corridor, as described in Section 3.6.2.1.

3.6.2.4 *115-kV Interconnection of the Gateway and Valencia Substations*

The proposed 115-kV transmission corridor would cross the Caralampi-White House-Hathaway and Lampshire Chiricahua-Graham soil associations. These associations are briefly discussed above. These soils do not have any characteristics that would present any obstruction to standard construction techniques.

3.7 WATER RESOURCES

This section discusses the existing water resources in the project area, including surface water, floodplains, wetlands, and groundwater.

3.7.1 Floodplains, Wetlands, and Surface Water

The following discussion of surface water, floodplains, and wetlands applies to all three proposed corridors. Information specific to the Western, Central, and Crossover Corridors is presented separately following the general discussion.

Surface Water. There are numerous small perennial surface waterbodies (present at all seasons of the year) in the proposed project area, some of which would be spanned by the proposed transmission line. The largest intermittent surface water feature, the Santa Cruz River, would not be crossed by any of the three proposed corridors. The Santa Cruz River, as shown in Figure 3.7–1, flows northward from Mexico into the project area. Historical data from the U.S. Geological Survey over 76 years (water years 1913-22, 1930-95) indicate that the average discharge near Nogales is 28.3 cubic feet per second (ft^3/s) (0.801 cubic meters per second [m^3/s]), or 20,500 acre-feet per year (acre-ft/yr). The median of yearly mean discharges is 20 ft^3/s (0.57 m^3/s), or 14,500 acre-ft/yr (USGS 2001).

Northern Portion. All three proposed corridors would cross one drainage in the vicinity of land managed by the Bureau of Land Management (BLM). There are no major washes on the BLM land.

Tumacacori Ecosystem Management Area. In the Tumacacori Ecosystem Management Area (EMA) of the Coronado National Forest, there are many ephemeral and three perennial streams and washes. One of the perennial streams is Sycamore Creek. A section of Sycamore Creek and its surrounding environment were nominated in 1993 as a Wild and Scenic River under the *National Wild and Scenic Rivers System Act* of 1968 (USFS 2001b). In 2004, a five-mile segment of Sycamore Canyon was determined to be eligible for the National Wild and Scenic Rivers System under the *National Wild and Scenic Rivers Act* of 1968, but it has not been designated as such. As shown in Figure 3.7–2, the proposed project (Western Corridor) crosses the Sycamore Canyon watershed, but is north of the eligible section, which is south of Ruby Road to the U.S.-Mexico border (see Figure 3.12–1). Arivaca Lake and Peña Blanca Lake, also shown in Figure 3.7–2, are man-made lakes within the Coronado National Forest, although not crossed by any of the three proposed corridors. Surface water uses within the Coronado National Forest include wildlife, livestock, recreation, mining, and domestic use.

The Forest Service (USFS) has classified the Tumacacori EMA according to a number of parameters evaluating the area's watersheds and surface water. Water quality is based on analysis of parameters such as fecal coliform, bacteria, dissolved oxygen, pH, salinity, and temperature at points downstream from the Coronado National Forest. Watershed condition and function is based on soil condition, soil productivity, riparian condition, water quality, and how water cycles through the ecosystem. Satisfactory watershed condition and function denote a watershed functioning at a sustainable desired level with no long-term changes predicted and a very low risk of management-induced deterioration. Unsatisfactory watershed condition and function would require capital investment to bring the watershed to the desired condition (USFS 2001b).

Nogales U.S.-Mexico Border Area. The proposed crossing of the U.S.-Mexico border would be the same for all three corridors. TEP's proposed project design is for the transmission line to cross the U.S.-Mexico border using monopole structures located at least 400 ft (120 m) away from the U.S.-Mexico border

(TEP 2003). No transmission line structures are proposed within 400 ft (120 m) of the U.S.-Mexico border, either in U.S. by TEP, or in Mexico by the CFE. The United States Section of International Boundary Water Commission, U.S.-Mexico (USIBWC) will not approve any construction in the United States that increases, concentrates, or relocates overland drainage flows into either the United States or Mexico. Surface drainage must be handled so that there is no increase of volume, peak runoffs, or flow concentration across the border in either direction (USIBWC 2003). Prior to construction of the selected corridor, Tucson Electric Power Company (TEP) would provide site-specific drawings to USIBWC for approval along with any hydrological or hydraulic studies for work proposed in the vicinity of the U.S.-Mexico border. This would include review of any structures proposed to be constructed in any drainage courses that cross the border. No structures are currently proposed to be constructed in drainage courses that cross the border.

Floodplains and Wetlands. Under Executive Order 11988 (May 24, 1977), *Floodplain Managemen*t, and Executive Order 11990 (May 24, 1977), *Protection of Wetland*s, Federal agencies are required to consider the impact of proposed actions on wetlands and floodplains. The Executive Orders are intended to be used by Federal agencies to implement floodplain and wetland requirements through existing procedures, such as those established to implement the *National Environmental Policy Act* of 1969 (NEPA). The U.S. Department of Energy (DOE) requirements for compliance with Executive Orders 11988 and 11990 are found in Title 10, *Code of Federal Regulations* (CFR), Part 1022, "Compliance with Floodplain/Wetlands Environmental Review Requirements." A Floodplain and Wetland Assessment, in compliance with Title 10 CFR 1022, has been prepared and is included in Appendix C of this Draft Environmental Impact Statement (EIS). A floodplain/wetlands assessment consists of a description of the proposed action, a discussion of its effects on the floodplain and wetlands, and consideration of the alternatives.

If DOE determines that there is no alternative to implementing a proposed project in a floodplain, a brief statement of findings must be prepared. This statement of findings would include a description of the proposed action, an explanation indicating why the project must be located in a floodplain, a list of alternatives considered, measures that will be taken to comply with state and local floodplain protection standards, and a description of the steps to be taken to minimize adverse impacts to the floodplain.

Floodplains are delineated (that is, mapped and classified) by the Federal Emergency Management Agency (FEMA). When maintained in a natural state, floodplains provide valuable services by moderating the extent of flooding, thereby (1) reducing the risk of downstream flood loss; (2) minimizing the impacts of floods on human safety, health, and welfare; and (3) providing support to wetlands, fish, and wildlife. For the purposes of this assessment, the 500-year and 100-year floodplains along the Santa Cruz River and its tributaries were taken from Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM), which are based on 2002 digital FIRM files for Pima and Santa Cruz counties. The FIRM files for Pima and Santa Cruz counties do not cover tribal or U.S. Forest Service (USFS) lands, and do not include delineations for a large portion of the "Southlands" area of Pima County, which are recently annexed lands in Pima County located south of Interstate-10 and east of Interstate-19. The FIRM maps indicate that the following tributaries occurring in the project area could have associated 100-year floodplains: Santa Cruz River, Sopori, Toros, Diablo, Las Chivas, Mariposa Canyon Wash, and several unnamed washes (see Figure 3.7–3, and Figures 2 through 5 in Appendix C). Delineated 500-year floodplains within the study areas are associated with the Santa Cruz River, Sopori, and Mariposa Canyon Wash. Additional unmapped 100-year and 500-year floodplains may also occur in the project area. In those areas where the 100- or 500-year floodplains have not been delineated, the county engineer or Federal agency may require the project proponent to establish the regulatory floodplain and floodway limits through a hydrologic and hydraulic study prepared by an Arizona registered professional civil engineer.

Wetlands are defined as areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions (40 CFR 230.3[t]). Wetlands serve a variety of functions within the ecosystem, including water quality preservation, flood protection, erosion control, biological productivity, fish and wildlife habitat, cultural values, aesthetic values, economic values, and scientific values.

Wetlands are a subset of waters of the United States. Waters of the United States are defined in the *Clean Water Act* (CWA) as "surface waters, including streams, streambeds, rivers, lakes, reservoirs, arroyos, washes, and other ephemeral watercourses and wetlands." Waters of the United States on the project area are under the jurisdiction of the U.S. Army Corps of Engineers (USACE), and activities that result in impacts to waters of the United States (including wetlands) must be permitted by USACE under Section 404 of the CWA. TEP is currently in consultation with USACE on a preliminary jurisdictional delineation for the South Substation. Upon final selection of an alternative, TEP would apply to USACE for either a nationwide permit or individual permit for the proposed corridor. TEP would site the transmission line structures and new access roads, to the extent feasible, such that they would span across (rather than be located within) any jurisdictional waters.

No wetlands (either within or outside of the USACE jurisdiction) were found in the proposed project corridors during field surveys conducted by Harris Environmental Group for the Biological Assessments (HEG 2003a, b, and c) and none were identified by USFS (USFS 2003). There may be small areas of potential wetlands within the proposed corridors that are associated with manmade stock ponds and impoundments; TEP would site the transmission line to avoid such areas.

3.7.1.1 *Western Corridor*

The Western Corridor would cross numerous very small dry washes and approximately 15 large washes (TEP 2001). Outside of the Coronado National Forest, the larger washes crossed, starting from west of Sahuarita and going south, include Demetries, Esperanza, Escondido, Proctor, Batamote, Sopori, and Saucito Wash as shown in Figure 3.7–1. Within the Coronado National Forest, the Western Corridor passes through the watersheds of the perennial surface waters of Sycamore, and Peck Canyons, shown in Figure 3.7–2, along with numerous smaller tributaries to these waterbodies. The following drainages are crossed by the Western Corridor in the Coronado National Forest: Alamo Canyon Creek, Pesqueria Canyon Creek, Calabasas Canyon Creek, Walker Canyon Creek, Peña Blanca Canyon Creek, Apache Canyon Creek, Murphy Canyon Creek, Lobo Canyon Creek, Sardina Canyon Creek, Sycamore Canyon Creek, and Cedar Canyon Creek. The Western Corridor approaches within 2 mi (3 km) of a total of 10 mapped springs (URS 2003a).

The USFS has classified (as described in Section 3.7.1) watershed and surface water parameters (watershed condition and function) within the Tumacacori EMA. The water quality is Satisfactory for Sycamore Canyon and the portion of the Western Corridor south of Ruby Road, and Unsatisfactory for the remaining portion of the Western Corridor north of Ruby Road. The areas with Unsatisfactory water quality also generally have Unsatisfactory watershed condition and function. Likewise, those areas with Satisfactory water quality also have Satisfactory watershed condition and function.

3.7.1.2 *Central Corridor*

The Central Corridor would cross numerous very small dry washes and approximately 14 large washes. Outside of the Coronado National Forest, the larger washes crossed, starting from west of Sahuarita and going south, include Demetries, Esperanza, Escondido, Sopori, Toros, Diablo, and Las Chivas Washes, and Tubac Creek, Aliso Canyon, and Rock Corral Canyon, as shown in Figure 3.7–1. Within the

Coronado National Forest, the Central Corridor passes through the watershed of the perennial surface waters of Peck Canyon, shown in Figure 3.7–2, along with numerous smaller tributaries. The following drainages are crossed by the Central Corridor in the Coronado National Forest: Potrero Canyon Creek, Alamo Canyon Creek, Pesqueria Canyon Creek, Bellotosa Canyon Creek, Calabasas Canyon Creek, Caralampi Canyon Creek, Agua Fria Canyon Creek, Peck Canyon Creek, Negro Canyon Creek, Tinaja Canyon Creek, Rock Corral Canyon Creek, Aliso Canyon Creek, Luback Creek, and Puerto Canyon Creek. The Central Corridor does not approach within 2 mi (3 km) of any mapped springs (URS 2003a).

USFS has classified the Tumacacori EMA according to a number of parameters evaluating the area's watersheds and surface water parameters (watershed condition and function). The water quality and watershed function is Unsatisfactory for the northern portion of the Central Corridor within the Tumacacori EMA, and is Satisfactory from just north of crossing Ruby Road to exiting the Forest near Nogales. The watershed condition is Unsatisfactory for almost the entire length of the Central Corridor within the Tumacacori EMA.

3.7.1.3 *Crossover Corridor*

The Crossover Corridor would cross numerous very small dry washes and approximately 15 large washes. Outside of the Coronado National Forest, the larger washes crossed, starting from west of Sahuarita and going south, include Demetries, Esperanza, Escondido, Proctor, Batamote, Sopori, and Saucito Wash, as shown in Figure 3.7–1. Within the Coronado National Forest, the Crossover Corridor passes through the watersheds of the perennial surface water of Peck Canyon, shown in Figure 3.7–2, along with numerous smaller tributaries. Agua Fria (Peña Blanca) Canyon is another perennial surface waterbody crossed by the Crossover Corridor in the Tumacacori EMA. The following drainages are crossed by the Crossover Corridor in the Coronado National Forest: Alamo Canyon Creek, Pesqueria Canyon Creek, Bellotosa Canyon Creek, Calabasas Canyon Creek, Caralampi Canyon Creek, Agua Fria Canyon Creek, Peck Canyon Creek, Lost Dog Canyon Creek, Pine Canyon Creek, Apache Canyon Creek, Murphy Canyon Creek, Lobo Canyon Creek, Cedar Canyon Creek, Sardina Canyon Creek, and Potrero Canyon Creek. The Crossover Corridor approaches within 2 mi (3 km) of 4 mapped springs (URS 2003a).

USFS has classified the Tumacacori EMA according to a number of parameters evaluating the area's watersheds and surface water parameters (watershed condition and function). The water quality and watershed function is classified as Unsatisfactory for the northern portion of the Crossover Corridor within the Tumacacori EMA, and is classified as Satisfactory from just north of crossing Ruby Road to exiting the Coronado National Forest near Nogales. The watershed condition has been classified as Satisfactory for the portion of the Crossover Corridor traversing Peck Canyon, and Unsatisfactory for remaining portions of the Crossover Corridor within the Tumacacori EMA.

3.7.1.4 *115-kV Interconnection of the Gateway and Valencia Substations*

There are several perennial streams and washes in or near the interconnection project area. The interconnection route parallels and crosses Mariposa Canyon Wash, which flows into Nogales Wash, located east of the Valencia Substation (see Figure 5 in Appendix C).

3.7.2 Groundwater

3.7.2.1 *Western Corridor*

The project area is located within two Active Management Areas (AMAs) for groundwater as identified by the State of Arizona, Department of Water Resources. The Santa Cruz AMA is located in the southern portion of the project area, while the Tucson AMA covers the northern part. These areas (and three others) were established to aid in the proper management of groundwater resources in Arizona.

In the Santa Cruz AMA, basin-fill sediments along the Santa Cruz River between Nogales and Amado form three aquifer units in the area. In ascending order, they are the Nogales Formation, the Older Alluvium, and the Younger Alluvium. Both of the latter alluvial units are generally unconfined and hydraulically connected, although the Older Alluvium does exhibit semi-confined and confined conditions in some places. The Nogales Formation is not a good aquifer (that is, does not produce useable quantities of water) and is best considered as "hydrologic bedrock" (ADWR 1999a).

The aquifer closest to the surface, the Younger Alluvium, is comprised of coarse-grained stream channel and floodplain deposits, and is typically found at depths from 40 to 150 ft (12 to 46 m). Hydraulic conductivities are quite large and some wells yield over 1,000 gallons per minute (3,785 liters per minute). The amount of groundwater in storage in the Younger Alluvium is estimated at 159,500 acre-ft (ADWR 1999a).

The Tucson AMA consists of two hydrogeologic subbasins; the Avra Valley Subbasin and the northern part of the Upper Santa Cruz Valley Subbasin. The uppermost aquifers in these subbasins are the Upper Alluvial Unit and the Recent Alluvial Deposits, respectively. The former is composed of silt and gravel, while the Recent Alluvial Deposits are predominately unconsolidated sand and gravel (ADWR 1999b).

Depth to groundwater in the Tucson AMA varies greatly, from less than 100 ft (30 m) to over 600 ft (183 m). In general, depths to water tend to be shallower near rivers and major washes and deeper near mountain fronts where land surface elevations are higher (ADWR 1999b).

Groundwater levels have declined substantially in the Tucson AMA in the last 50 years as a result of groundwater pumping for municipal, agricultural, and industrial uses. In some areas outside of the project area, significant land subsidence has occurred.

The amount of groundwater in storage to a depth of 1,000 ft (3,785 m) in the Tucson AMA is estimated at 12.7 million acre-ft (ADWR 1999b).

The U.S. Environmental Protection Agency (EPA) designated the aquifers in the Tucson and Santa Cruz AMAs as Sole Source Aquifers. Under this program, the aquifers present in this area are collectively referred to as the Upper Santa Cruz and Avra Basin Aquifer. The Sole Source Aquifer program was created under the *Safe Drinking Water Act* of 1974 to protect drinking water supplies in areas with few or no alternative sources to the groundwater resource.

A small number of private wells are scattered throughout the proposed project area.

3.7.2.2 *Central Corridor*

The groundwater resources described above for the Western Corridor also apply to the Central Corridor.

3.7.2.3 *Crossover Corridor*

The groundwater resources described above for the Western Corridor also apply to the Crossover Corridor.

3.7.2.4 *115-kV Interconnection of the Gateway and Valencia Substations*

The groundwater resources described above for the Western Corridor also apply to the Interconnection Corridor.

3.8 AIR QUALITY

This section discusses the climatic regime and existing air quality in the area between Tucson and Nogales, Arizona. Because this information applies to each alternative in the same manner, including the project area of the 115-kv Gateway and Valencia Substations Interconnection, the discussion is combined rather than repeated separately for each alternative. Refer to Section 3.10.2, Corona Effects, for a discussion of potential photochemical reactions in the air surrounding transmission lines.

3.8.1 Climate

The climate in the vicinity of the project is an arid desert characterized by hot temperatures, large daily air temperature ranges, and sparse precipitation. Table 3.8–1 presents the climatological data for the Tucson area normalized over a period of 30 years.

Table 3.8–1. Climate Data for Tucson, Arizona

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Temperature												
Average Daily Maximum Temperature (°F)	63.9	67.8	72.8	81.2	89.9	99.6	99.4	96.8	93.3	84.3	72.7	64.3
Average Daily Minimum Temperature (°F)	38.6	41.0	44.6	50.4	58.7	67.9	73.6	72.1	67.5	56.6	45.6	39.8
Average Monthly Temperature (°F)	51.3	54.4	58.7	65.8	74.0	83.8	86.6	84.5	80.4	70.4	59.2	52.0
Precipitation												
Maximum Monthly Precipitation (in)	4.81	2.90	2.26	1.66	1.11	1.46	6.17	7.93	5.11	4.98	1.90	5.02
Average Monthly Precipitation (in)	0.87	0.70	0.72	0.30	0.18	0.20	2.37	2.19	1.67	1.06	0.67	1.07
Minimum Monthly Precipitation (in)	T	0.00	0.00	0.00	0.00	0.00	0.01	0.23	0.00	0.00	0.00	0.00
Mean number of days of precipitation (0.1 in or more)	4.6	3.8	4.3	2.0	1.6	1.7	10.1	9.4	4.6	3.3	3.0	4.7
Percent of Possible Sunshine	80	82	86	92	93	93	78	80	87	88	85	79
Wind												
Mean Speed (mph)	7.9	8.1	8.6	8.9	8.8	8.7	8.4	7.9	8.3	8.2	8.1	8.3
Prevailing Wind Direction	SE	SE	SE	SE	SE	SSE	SE	SE	SE	SE	SE	SE

T = trace amount.
Source: Climate 2003.

The data show a mean annual temperature of 68.4ºF (20.2ºC) with average maximum temperatures ranging from 63.9ºF (17.7ºC) in January to 99.6ºF (37.6ºC) in June. The average annual precipitation for the period of record is 12.0 in (30.5 cm), peaking from July through September, with a second lower peak in the winter months. The average maximum precipitation ranges from 1.11 in (2.8 cm) in May to 7.93 in (20.1 cm) in August, with the minimum precipitation ranging from 0.0 in (0 cm) to 0.23 in (0.58 cm) in August. The mean number of days receiving 0.1 in (0.25 cm) or more of precipitation ranged from 1.6 days in May to 10.1 days in July. The percent of possible sunshine ranges from 78 percent to 93 percent.

The mean wind speed ranges from 7.9 mi per hour (13 km per hour) to 8.9 mi per hour (14 km per hour) with the direction of prevailing wind blowing from the southeast. Figure 3.8–1 is a "wind rose" of surface wind measurements taken in 1990 at the National Weather Station at Tucson International Airport (NOAA 2003).

The Coronado National Forest portion of each corridor is higher in elevation and has lower average temperatures and higher levels of precipitation than the rest of the corridors. For example, mean annual precipitation in evergreen woodland communities is 20 in (51 cm).

3.8.2 Air Quality

The U.S. Environmental Protection Agency (EPA) established air quality standards for six different pollutants, referred to as criteria pollutants, based on the protection of public health and the environment. These National Ambient Air Quality Standards (NAAQS) set limits for the following criteria pollutants: nitrogen dioxide (NO_2), carbon monoxide (CO), ozone (O_3), sulfur dioxide (SO_2), lead (Pb), and inhalable particulate matter (PM_{10}), or particles with an aerodynamic diameter less than or equal to 10 microns. (The diameter of a human hair is approximately 70 microns.) In addition, in 1997 EPA finalized new air quality standards for ozone and $PM_{2.5}$ (particles with an aerodynamic diameter less than or equal to 2.5 microns). A series of legal challenges in the U.S. Court of Appeals ensued, culminating with the U.S. Supreme Court upholding the NAAQS for ozone and $PM_{2.5}$ on February 27, 2001. Based on the ambient (outdoor) levels of the criteria pollutants, EPA evaluates individual Air Quality Control Regions (AQCRs) to establish whether or not they meet the NAAQS. Areas that meet the NAAQS are classified as attainment areas, and areas that exceed the NAAQS for a particular pollutant(s) are classified as non-attainment areas for the pollutant(s). Areas that have been redesignated by EPA as attainment areas within the last 10 years are classified as maintenance areas.

There are over 100 ambient air quality monitoring sites located throughout Arizona (ADEQ 2002). These sites monitor air pollutants and other parameters on a continuous or periodic basis. The air pollutants monitored include: CO, hazardous air pollutants (metals), nitrogen oxides (NO_x), SO_2, O_3, specific Volatile Organic Compounds (VOCs), PM_{10}, and $PM_{2.5}$.

The proposed project is located within portions of Pima and Santa Cruz Counties. Table 3.8–2 shows the attainment status of the project area and vicinity. The project area is designated as being in attainment or unclassifiable for all criteria pollutants, with the exception of the Nogales area in Santa Cruz County, which is designated as a moderate non-attainment area for PM_{10}, and for which the state has set specific emissions and permitting requirements. The Tucson area is a CO maintenance area. Figure 3.8–2 shows the location of the proposed project relative to the Nogales PM_{10} non-attainment area and the Tucson CO maintenance area. EPA has not yet classified areas as being in attainment or non-attainment for $PM_{2.5}$ standards, as states are still collecting data to establish these classifications.

Table 3.8–2. Criteria Pollutant Attainment Status in the Proposed Project Area

Area	Pollutant	Attainment Status[a]
Pima County (excluding Rillito and Ajo)[b]	NO_2	Unclassifiable
	SO_2	Better than national standards
	PM_{10}	Unclassifiable
	CO	Attainment[c]
	Pb	Attainment
	O_3	Unclassifiable/Attainment
Santa Cruz County (excluding Nogales for PM_{10})	NO_2	Unclassifiable
	SO_2	Better than national standards
	PM_{10}	Unclassifiable
	CO	Unclassifiable/Attainment
	Pb	Attainment
	O_3	Unclassifiable/Attainment
Santa Cruz County – Nogales	PM_{10}	Non-attainment (moderate)

[a] Unclassifiable areas are areas that cannot be classified on the basis of available information as meeting or not meeting the NAAQS for a particular pollutant.
[b] Rillito and Ajo are non-attainment areas northwest of Tucson, outside the area of study for the proposed project.
[c] The Tucson area was redesignated as a CO attainment area in 2000 and is thus classified as a CO maintenance area.
Source: EPA 2003.

The primary sources of PM_{10} in the project area are large copper mines, traffic on unpaved roads, construction activities, and significant natural events such as windstorms. Another potential source of PM_{10} associated with the Nogales area's non-attainment status is activities on the Mexican side of the international border (Yockey 2001). The Pima County Department of Environmental Quality (PDEQ) and Arizona Department of Environmental Quality (ADEQ) monitor air quality and regulate emissions of air pollutants from industrial and commercial facilities as required under the *Clean Air Act* (CAA) and state and local regulations. Attainment and maintenance of the NAAQS in the project area are governed by a federally enforceable air quality management plan, called a State Implementation Plan (SIP).

The CAA provides special protection for visibility and other air quality related values in specially designated areas such as National Parks and Wilderness Areas, officially designated as "Class I" areas. Special visibility modeling analysis must be performed for major new sources and modifications that may affect a Class I area under the CAA's Prevention of Significant Deterioration (PSD) program. The nearest Class I area to the proposed project is the Saguaro National Monument East, an estimated 18 mi (29 km) north of TEP's South Substation in Sahuarita (Yockey 2001). See Section 3.2 for discussion of visual range.

3.9 NOISE

This section discusses the existing noise levels in the vicinity of the proposed TEP Sahuarita-Nogales Transmission Line Project and describes the basic measurements used for sound.

3.9.1 Background

With regard to this Environmental Impact Statement (EIS), noise concerns are associated primarily with construction activities. Noise is also a potential concern for the operation of transmission lines, as described in Section 3.10.2, Corona Effects. The description of the existing sound environment requires a general understanding of how sound is measured and its effects on the human environment. Because this background information applies to each alternative in the same manner, the discussion is combined rather than repeated separately for each alternative.

Noise is defined as sound that is undesirable because it interferes with speech, communication, or hearing; is intense enough to damage hearing; or is otherwise annoying. The measurement and human perception of sound involve two basic physical characteristics: intensity and frequency. Intensity is a measure of the sound energy of the vibrations, and frequency is the measure of the tone or pitch of the sound.

The physical unit most commonly used to measure sounds is the decibel (dB). The higher the energy carried by the sound, the louder the perception of that sound, and thus, the higher the dB rating of the sound. A sound level of just above 0 dB is approximately the threshold of human hearing and is barely audible under extremely quiet listening conditions. Normal speech has a sound level of approximately 60 dB. The dB scale is logarithmic, meaning that a 60 dB sound is not perceived as twice as loud as a 30 dB sound. Rather, a 60 dB sound is perceived as approximately twice as loud as a 50 dB sound. Humans typically can barely perceive loudness changes of less than 2 to 3 dB.

The second important characteristic of sound is its tone or frequency, which is the number of times per second the air vibrates, measured in Hertz (Hz). The human ear is most sensitive to frequencies in the 1,000 to 4,000 Hz range. To account for the variable response of the human ear to different tones, decibels may be adjusted to A-weighted decibels. The adjusted A-weighted decibels (dBA) represent the human hearing response to sound. The maximum sound levels of typical events are shown in Table 3.9–1.

In addition to measuring a single sound event, a time-average sound level can be calculated (also in dBA) to represent the average sound over a specified length of time. For the evaluation of community noise effects, and particularly construction noise effects, the Day-Night Average Sound Level (DNL) is often used. The DNL averages construction sound levels at a location over a complete 24-hour period, with a 10 dB adjustment added to those noise events that take place between 10:00 p.m. and 7:00 am. This 10 dB “penalty” represents the added intrusiveness of sounds that occur during normal sleeping hours, both because of the increased sensitivity to noise during those hours and because ambient (background) sound levels during nighttime are typically about 10 dB lower than during daytime hours.

It is important to distinguish between the measurement of a single sound event and the calculation of a time-averaged DNL, both of which are often represented in dBA. Because the DNL is a measurement of an average, a DNL of 50 dBA could result from a few noisy events or a large number of quieter events. DNL does not represent the sound level heard at any particular time, but rather represents the total sound exposure.

The U.S. Department of Housing and Urban Development established a DNL standard of 65 dBA for homes that are funded through federally guaranteed loans. In 1974, the U.S. Environmental Protection

Agency (EPA) identified noise levels that could be used to protect public health and welfare, including prevention of hearing damage, sleep disturbance, and communication disruption. Outdoor DNL values of 55 dBA were identified as desirable to protect against activity interference and hearing loss in residential areas and at educational facilities.

Table 3.9–1. Comparative A-Weighted Sound Levels

Common Outdoor Sound Levels	Sound Level (dBA)	Common Indoor Sound Levels
	110	
Jet flyover at 1,000 feet		Rock band
	100	
Gas lawnmower at 3 feet		Inside subway train
	90	
Diesel truck at 50 feet		Food blender at 3 feet
		Garbage disposal at 3 feet
Noisy urban daytime	80	
		Shouting at 3 feet
Gas lawnmower at 100 feet	70	Vacuum cleaner at 10 feet
		Normal speech at 3 feet
Commercial area	60	
Heavy traffic at 300 feet		
		Large business office
		Dishwasher in next room
	50	
		Small theater, large conference room (background)
Quiet urban nighttime	45	
		Library (background)
Quiet suburban nighttime	40	
		Bedroom at night
		Concert hall (background)
Quiet rural nighttime	30	
		Broadcast and recording studio (background)
	10	
	0	Threshold of hearing

Source: Canter 1977.

3.9.2 Western, Central, and Crossover Corridors

The proposed transmission line corridors cross primarily rural undeveloped land. Thus, current noise levels along each corridor are predominately low, typically with a DNL near 30 dBA. The DNL may increase to 45 to 60 dBA in suburban residential areas and near industry, major roads, and I-19. In wilderness locations the DNL is typically on the order of 20 dBA (Canter 1977).

All existing noise levels are below what is normally considered compatible with residential land uses and other noise impact guidelines. The primary sources of noise are (1) everyday vehicular traffic along

nearby roadways, such as I-19; (2) minor construction activities related to maintenance of roadways, bridges, and the other structures and facilities; and (3) noise associated with industrial activity.

Within the Coronado National Forest, the existing noise sources are minor and are primarily associated with recreation (for example, hikers, off-road vehicle users, and picnickers at Peña Blanca Lake Recreation Area). Existing noise derived from construction and recreation is generally intermittent and highly variable depending on the time of day and year. In addition, the proposed project area, including portions of the Coronado National Forest, is part of a Military Operating Area in which the U.S. Air Force conducts periodic low-level flights.

3.9.3 115-kV Interconnection of the Gateway and Valencia Substations

Since the proposed interconnection project area consists of a mix of residential, commercial, and industrial land uses, and crosses SR 189 and I-19, the DNL ranges from 45 to 60 dBA that is typical for this setting.

3.10 HUMAN HEALTH AND ENVIRONMENT

This section discusses existing background information regarding electric and magnetic field (EMF) effects and corona effects. Because this background information applies to each alternative in the same manner, including the project area of the 115-kV Gateway and Valencia Substations Interconnection, the discussion is combined rather than repeated separately for each alternative.

Both current and voltage are required to transmit electrical energy over a transmission line. The current, a flow of electrical charge, measured in amperes (A), creates a magnetic field. The voltage, the force or pressure that causes the current to flow, measured in units of volts (V) or thousand volts (kV), creates an electric field. Both fields occur together whenever electricity flows, hence the general practice of considering both as EMF exposure.

The possibility of deleterious health effects from EMF exposure has increased public concern in recent years about living near high-voltage lines. The available data have not revealed any conclusive evidence that EMF exposure from power lines poses a hazard to animal or human health. However, while such a hazard has not been established from the available evidence, the same evidence does not serve as proof of a definite lack of a hazard. In light of the present uncertainty, this section and Appendix B contain a summary of the existing credible scientific evidence relevant to evaluating the potential impacts of EMF, as required by the *National Environmental Policy Act* of 1969 (NEPA) implementing regulations (40 CFR 1502.22).

This section also discusses the safety considerations in the immediate vicinity of transmission lines. Additionally, the potential for corona effects on the human environment from transmission lines is discussed. Corona is the electrical breakdown of air into charged particles caused by the electrical field at the surface of conductors, the wires that carry electricity. Corona effects are of concern for potential radio and television interference, audible noise, and production of visible light.

3.10.1 Electric and Magnetic Fields

Magnetic Field Health Studies. The focus of the EMF health studies for power lines has been on the magnetic fields created by the power lines. Electric fields were studied in previous years, and were not found to be a concern for levels typical of power lines. A 60 Hz magnetic field is created in the space around transmission line conductors by the electric current flowing in the conductors. This is the frequency of ordinary household current, usually referred to as 60 cycle. The strength of the magnetic field produced by an electric transmission line depends on the electrical load, the configuration of the conductors (spacing and orientation), the height of the conductors, the distance from the line, and the proximity of other electrical lines. As the load on a transmission line varies continually on a daily and seasonal basis, the magnetic fields likewise vary throughout the day and year. Physical structures, such as buildings (unless of metal construction), are usually transparent to magnetic fields created by power lines (that is, buildings do not generally have a shielding effect), thus fueling the interest in potential health effects.

Existing EMF levels in the project vicinity are primarily dominated by EMF from common household appliances. EMF levels of some common household appliances are listed in Table 3.10–1. This table shows that the magnetic fields at a distance of 3 ft (1 m) range from less than 0.1 milligauss (mG) to 18 mG. Existing transmission and distribution lines also contribute to EMF levels. Figure 3.11–1 shows existing transmission lines in the project vicinity. As an example of maximum existing EMF, Tucson Electric Power Company (TEP) has modeled existing EMF levels on Bureau of Land Management (BLM) land (reference Figure 1.1–4) from the two existing transmission lines that run adjacent to the north of the proposed project. At a distance of 280 ft (85 m) south of the existing southernmost

transmission line (which coincides with the proposed location of TEP's new transmission line), the existing magnetic field is 1.1 mG and the existing electric field is 0.01 kV/m. At a distance of 340 ft (104 m) south of the existing southernmost transmission line (which coincides with the southern edge of the right-of-way [ROW] of TEP's proposed transmission line), the existing magnetic field is 0.76 mG and the existing electric field is 0.006 kV/m (TEP 2003). The existing EMF level at the southern edge of the proposed ROW is below an average daily exposure to magnetic fields from some common household appliances (approximately 0.8 mG) (NIEHS 1999).

Table 3.10–1. EMF Level of Some Common Household Appliances

Appliance	Magnetic Field at 3 ft (mG)
Clothes dryers	0.0-1
Clothes washers	0.2-0.48
Electric shavers	Less than 0.1-3.3
Fluorescent desk lamp	0.2-2.1
Hair dryers	Less than 0.1-2.8
Irons	0.1-0.2
Portable heaters	0.1-2.5
Television	Less than 0.1-1.5
Toasters	Less than 0.1-0.11
Vacuum cleaners	1.2-18.0

Source: Waveguide 2003.

No Federal regulations have been established specifying environmental limits on the strengths of fields from power lines. However, the Federal government continues to conduct and encourage research necessary for an appropriate policy on EMF. Several states have opted for design-driven regulations ensuring that fields from new lines are generally similar to those from existing lines. For instance, Florida and New York require ROWs for new power lines 500-kV and higher to be wide enough so that the magnetic field at the edge of the ROW is equivalent to the magnetic field of lower voltage (345-kV) lines. Some states have set specific environmental limits on one or both fields in this regard. Florida and New York limit the magnetic field at the edge of a ROW to 200 mG. These limits are, however, not based on any specific health effects. Most regulatory agencies believe that health-based limits are inappropriate at this time. They also believe that the present knowledge of the issue does not justify any retrofit of existing lines.

Safety. The potential safety considerations in the immediate vicinity of electric power lines include the potential for electric shock, the clearance of the power lines aboveground, low-level military flights in the area, measures to prevent unauthorized climbing of the poles, and the proximity of the transmission lines to other utilities such as the El Paso Natural Gas Company (EPNG) pipeline. The proposed project area includes portions that are part of a Military Operating Area in which the U.S. Air Force conducts periodic low-level flights (see Chapter 10 for the U.S. Department of Energy [DOE] consultation with the U.S. Air Force).

The electric field created by a high-voltage transmission line extends from the energized conductors to other conducting objects such as the ground, towers, vegetation, buildings, vehicles, and persons. Potential field effects can include induced currents, steady-state current shocks, spark discharge shocks, and in some cases field perception and neurobehavioral responses.

- *Induced Currents* – When a conducting object, such as a vehicle or person, is placed in an electric field, currents and voltages are induced. For example, it is not unusual for a fluorescent light tube to glow in the vicinity of high voltage lines. The magnitude of the induced current depends on the

electric-field strength and size and shape of the object. The induced currents and voltages represent a potential source of nuisance shocks near a high-voltage transmission line.

- *Steady-State Current Shock* – Steady-state currents are those that flow continuously after a person contacts an object, such as a vehicle, and provides a path to ground for the induced current. The effects of these shocks range from involuntary movement in a person to direct physiological harm. Steady-state current shocks occur in instances of direct or indirect human contact with an energized transmission line.

- *Spark-Discharge Shocks* – Induced voltages appear on objects such as vehicles when there is an inadequate ground. If the voltage is sufficiently high, a spark-discharge shock will occur as contact is made with the ground. Spark-discharge shocks that create a nuisance occur in instances of carrying or handling conducting objects, such as irrigation pipe, under transmission lines.

- *Field Perception and Neurobehavioral Responses* – When the electric field under a transmission line is sufficiently strong, it can be perceived by hair raising on an upraised hand. This is the effect of harmless levels of static electricity, similar to the effect of rubbing stocking feet on a carpet.

An additional safety concern in the immediate vicinity of electric power lines is the potential for climbing of poles. Poles can be designed in a manner to prevent the unauthorized climbing of the poles by members of the public. In addition, sufficient clearance height must be considered to avoid contact with the lines either directly or by contact with other objects.

The Amended "Certificate of Environmental Compatibility" issued to TEP on October 29, 2001, by the Arizona Corporation Commission (ACC) (ACC 2001), includes a provision that all transmission structures must be at least 100 ft (30 m) away from the edge of the existing EPNG pipeline ROW. TEP would follow this provision in the precise siting of the proposed project.

Smoke is a conductor of electrical current. When a fire is in the vicinity of a 345-kV transmission line, the transmission line could start fires outside the fire perimeter. From 1986 through 1999 there were 67 human-caused fires (burning 13,747 acres [5,563 ha]), and 24 lightning-caused fires (burning 5,692 acres [2,303 ha]) within the Tumacacori Ecosystem Management Area (EMA) of the Coronado National Forest. Of these fires, 53 were less than 10 acres (4 ha), 23 were between 10 and 300 acres (4 and 121 ha), and 5 were over 300 acres (121 ha). The fires were dispersed throughout the EMA, with a higher concentration near high-use areas such as along Ruby Road (USFS 2001a).

3.10.2 Corona Effects

Corona is the electrical breakdown of air into charged particles caused by the electrical field at the surface of conductors. Corona is of concern for potential radio and television interference, audible noise (60-cycle hum), and photochemical reactions. Corona can occur on the conductors, insulators, and hardware of an energized high-voltage transmission line. Corona on conductors occurs at locations where the field has been enhanced by protrusions, such as nicks, insects, or drops of water. During fair weather, the number of these sources is small and the corona effect is insignificant. However, during wet weather, the number of these sources increases and corona effects are much greater (DOE 2001a).

The Electric Power Research Institute (EPRI) reports that "corona and arcing activity may occur at numerous points in overhead transmission, substation, and distribution power systems. This activity may result in audio noise or radio interference complaints or indicate a defective component that may be close to failure. If the offending component can be located, it can be replaced. EPRI's daytime corona and arcing visual inspection technology (DayCor) lets the exact position, type, and magnitude of corona

activity be determined, thus enabling the identification of the offending component and the possibility of failure. DayCor observations are totally unaffected by sunlight and allow corona inspection to become part of everyday inspections" (EPRI 2001).

- *Audible Noise* – Corona-generated audible noise from transmission lines is generally characterized as a cracking/hissing noise. The noise is most noticeable during wet weather conditions. There are no noise codes applicable to transmission lines in Arizona. Audible noise from transmission lines is often lost in the background noise at locations beyond the edge of the ROW. Refer to Section 3.9, Noise, for a complete description of existing noise in proposed project area.

- *Radio and Television Interference* – Corona-generated radio interference is most likely to affect the amplitude modulation (AM) broadcast band (535 to 1,605 kilohertz); frequency modulation (FM) radio is rarely affected. Only AM receivers located very near to transmission lines have the potential to be affected by radio interference. The potential for interference from corona effects is more severe during damp or rainy weather.

- *Visible Light* – Corona may be visible at night as a bluish glow or as bluish plumes. On the transmission lines in the area, the corona levels are so low that the corona on the conductors usually is observable only under the darkest conditions with the aid of binoculars.

- *Photochemical Reactions* – When coronal discharge is present, the air surrounding the conductors is ionized and many chemical reactions take place producing small amounts of ozone and other oxidants. Approximately 90 percent of the oxidants are ozone, while the remaining 10 percent are composed principally of nitrogen oxides. Refer to Section 3.8, Air Quality, for a complete description of existing air quality.

3.11 INFRASTRUCTURE

This section discusses the existing infrastructure in the project area, including utilities and facilities. Also discussed are current waste management issues. Roads are discussed in Section 3.12, Transportation. Because this background information applies to each alternative in the same manner, including 115-kV Gateway and Valencia Substations Interconnection project area, the discussion is combined rather than repeated separately for each.

3.11.1 Utilities and Facilities

Figure 3.11–1 depicts the existing utility infrastructure in the project area. Tucson Electric Power Company's (TEP's) existing South Substation is located at 500 East Pima Mine Road (Section 36, Township 16 South, Range 13 East). The site is an estimated 26.4 acres (10.7 ha) and is wholly within the incorporated town of Sahuarita, Arizona. Two existing transmission lines provide most of the power to the substation: a 345-kV transmission line from Westwing Substation near Phoenix enters from the west and another 345-kV line from Springerville, via Vail Substation, enters from the east. The proposed project would utilize existing power on the Western electric grid, and would not require development of new power generating facility or the expansion of the Palo Verde Nuclear Generating Station located approximately 50 mi (80 km) west of Phoenix, Arizona.

TEP currently has two transmission lines in the Sahuarita area both of which cross Federal land managed by the Bureau of Land Management (BLM): 345-kV and 138-kV. Arizona Electric Power Company has three transmission lines in the Sahuarita area: 345-kV, 230-kV, and 115-kV. The remaining transmission line in the area belongs to TRICO Electric Cooperative, Inc., and is a 69-kV line. Citizens Communications Company (Citizens) has a 115-kV transmission line from the vicinity of Sahuarita to Nogales, Arizona. An electrical distribution line runs east from Peña Blanca Lake Recreational Area following Ruby Road and exiting National Forest System land.

There are facilities at Peña Blanca Lake including a boat launch, fishing dock, picnic area, and a campground at Calabasas Group Area.

An El Paso Natural Gas Company (EPNG) pipeline is present in the project area. It is buried within a 50-ft (15-m) right-of-way (ROW) and runs from Nogales west of Interstate 19 (I-19) to just west of Sahuarita. This pipeline, shown in Figure 3.11–1, is 6 in (15 cm) in diameter and transports natural gas at a pressure of 650 lbs/in^2 (46 kg force/cm^2), delivering approximately 500,000 ft^3 (14,158 m^3) per day. There is a road of varying width above portions of the pipeline. A railroad line also runs between Nogales and Sahuarita as shown in Figure 3.11–1.

3.11.2 Waste Management

TEP's existing South Substation generates minor quantities of municipal waste, usually limited to paper and plastic wrapping materials from new equipment. Municipal waste generated is disposed of in an approved county landfill. No hazardous waste is generated from substation operation.

There are no significant waste management issues associated with the existing transmission lines in the area. There are several solid waste disposal facilities located in the project area. The Los Reales Solid Waste Facility is in Pima County, about 8 mi (13 km) north and 4 mi (6.4 km) east of the South Substation. Two solid waste landfills are located near the proposed Central Corridor: the northern most is in Section 25, Township 20 South, Range 12 East and is an estimated 0.75 mi (1.2 km) south of Amado; the southerly landfill is in the NW4 of Section 16, Township 22 South, Range 13 East, an estimated 1.6 mi (2.6 km) east of the Central Corridor.

3.12 TRANSPORTATION

This section discusses the existing transportation system in the vicinity of the Tucson Electric Power Company (TEP) Sahuarita-Nogales Transmission Line proposed project. The discussion includes a description of the existing roads and access for each alternative corridor in Pima and Santa Cruz Counties, and quantification of existing traffic patterns. Figure 3.11–1 shows most of the roads and railroad lines in the vicinity of the project.

On a Forest-wide basis, Forest Plan Amendment No. 8 (June 1996, replacement page 34) limits the density of existing roads and new road construction to one mile of road or less per square mile. Existing road density on the CNF is not easy to calculate accurately at this time due to the proliferation of unclassified roads on the Forest and the lack of validation of the geo-spatial data and the tabular data. As area and project scale road analyses are conducted in the future, geo-spatial and tabular data will be refined, and a more precise calculation of density can be obtained. Using the current data contained in the tabular INFRA database, the road density on the Coronado can be approximated to be between 0.8 and 1.1 miles per square mile.

This estimate was calculated in the following way: Using the gross land area of 1,788,266 acres (*FS 383 – Land Areas as of 9/2000*) and the 3035.21 total miles in the inventory, density is calculated to be 1.1 miles/mi^2 This calculation does not discount the private lands within the forest boundaries and it includes some roads outside the boundary. Using the area of National Forest System Lands of 1,717,857 acres and 2187.25 miles of FS jurisdiction road in the inventory, density is calculated to be 0.8 miles/mi^2. This calculation does not include non-Forest Service jurisdiction roads within the Forest boundary. Of course, neither of these calculations takes into consideration unclassified roads, which are known to exist on the Forest, especially on the districts bordering Mexico.

Unclassified roads, some of which are referred to as "wildcat" roads, are user-created roads not likely needed to meet Forest resource management objectives. Such roads are not considered part of the official Forest transportation system. These roads pose the greatest threat to public safety and contribute most to environmental degradation because they were not designed or constructed to any acceptable standards. Decommissioning of these roads will require roads analysis per FSM 7712.12b. The unclassified road inventories will be conducted using existing data and other readily available sources of information, such as aerial photographs, as allowed by FSM 7712.14 (see USFS 2003a for additional information).

3.12.1 Western Corridor

As shown in Figure 1.1–4, Interstate 19 (I-19) is the primary continuous transportation link running north to south between Sahuarita and Nogales, with approximately 70 exits to collector roadways. In addition, the transportation system in the proposed project vicinity consists of ranch trails and graded dirt roads that provide access to cattle tanks, are utilized for construction and maintenance of existing utility rights-of-way (ROWs), or are utilized for fire suppression.

The three exits from I-19 that would be the primary points of access to the Western Corridor mobilization and reporting sites are (1) Pima Mine Road exit in Sahuarita to access the South Substation, (2) Arivaca Road exit in Amado for the central access point, and (3) Mariposa Road exit to access the southern mobilization yard at the Gateway Substation in Nogales. The average daily traffic numbers for the year 2000 on I-19 at the segment north of Mariposa Road (milepost 2.95) are 18,744 vehicles, at the Arivaca Road exit (milepost 30.95) are 17,919 vehicles, and at the Pima Mine Road exit (milepost 49.62) are 25,271 vehicles. The percentage of commercial traffic is fairly uniform, at approximately 10.5 percent (ADOT 2000).

Access to the proposed ROW within the Western Corridor would be on existing utility maintenance roads, ranch access roads and trails, and new access ways where no access currently exists. Access to the South Substation would be on existing electric utility maintenance dirt roads. On non-Federal land west of I-19, access to the Western Corridor would be from paved section line roads and along short dirt radial trails that range in length from 75 ft (23 m) to 200 ft (60 m).

On the land managed by the Bureau of Land Management (BLM), west of Sahuarita, an existing access road to TEP's 345-kV Westwing-South transmission line would be utilized by turning off Mission Road. In this area, two short access road segments would be developed for construction of the transmission line. The first new access road, located west of Mission Road, would provide access to four structure sites and would be an estimated 0.63 mi (1.0 km) in length. The second would provide access to one pole east of Mission Road and would be an estimated 0.13 mi (0.21 km) in length. These two new access road segments would be an estimated 12 ft (3.7 m) wide and would primarily provide adequate clearance for delivery of long pole segments in an area that has steep inclines on the existing access road. Access to the remaining structures on BLM land would be accomplished by creating spurs to each structure from the existing access road, totaling an estimated 0.14 mi (0.23 km) (TEP 2003).

Upon reaching Continental Road west of Green Valley, the Western Corridor joins the El Paso Natural Gas Company (EPNG) pipeline ROW. At this point, the paved road to the south has a series of access points to the EPNG pipeline ROW which would be used as much as possible to access the proposed structure locations. As the Western Corridor turns to the southwest, the access points would be coordinated with the operations of the land owner and would be sited on previously disturbed terrain as much as possible, including many dirt trails which have been established by ranching and hunting interests over the past 50 years. In the vicinity of Amado and south of Arivaca Road, the ROW access would shift to the Arivaca Road mobilization site and utilize the same trail access as much as possible. Radial access trails or paths to structures would cross open desert scrub and avoid trees and shrubs where feasible.

Within the Tumacacori Ecosystem Management Area (EMA) of the Coronado National Forest, approximately 320 mi (515 km) of Forest Service (USFS) classified roads exist, both paved and unpaved (USFS 2001b). Classified roads are those under the jurisdiction of USFS that are determined to be necessary for the protection, administration, and use of the National Forest System land and are intended for long-term use. Classified roads are inventoried, maintained, and managed by USFS. In addition to USFS classified roads there are unclassified roads, known as wildcat roads, which are roads on National Forest System lands that are not needed and not managed as part of the USFS transportation system. Unclassified roads include unplanned roads, abandoned travelways, off-road vehicle tracks which have not been designated and managed as a trail, and those roads no longer under permit or authorization. Wildcat roads have resulted from the increasing numbers of users on Coronado National Forest. Because most wildcat roads have not been subjected to the USFS planning process, and therefore may not meet technical or environmental protection standards, they may pose a threat to both the environment (for example, increased sedimentation in riparian corridors) and to user safety (URS 2003a).

There are approximately 31 vehicular access points to the EMA. Ruby Road, a USFS classified road, is one of the primary access points. The current configuration of the road system serves as a "limiter" to the EMA in accordance with the Forest Plan (USFS 1986). The Forest Plan gives direction to "Limit density of existing and new road construction to one mile of road or less per square mile" (0.62 km of road per km^2); USFS has indicated that current road density is estimated to be near this level (USFS 2001b). Within the vicinity of the Western Corridor, approximately 54 percent of the existing roads are wildcat roads, with the remaining 46 percent being USFS classified roads (URS 2003a).

Figure 3.12–1 shows existing roads within the Tumacacori EMA, some of which would provide access to the Western Corridor. This inventory of existing roads is based on the Roads Analysis (RA) for the proposed project for which data were obtained from USFS, agency and public input; interpreted from recent aerial imagery; and documented during extensive field reviews (URS 2003a). Below is a description of the USFS Road Maintenance Levels for the existing roads shown in Figure 3.12–1.

USFS Road Maintenance Levels

- Level 1 Roads: Closed for more than one year to motorized use, but may be open for non-motorized use. Roads are physically closed (for example, with gates) and have basic maintenance such as drainage facilities, but dirt surfaces.
- Level 2 Roads: Open for use by high-clearance vehicles, with normally minor traffic including dispersed recreation uses, with dirt surfaces.
- Level 3 Roads: Open and maintained for low-speed, single lane driving in standard passenger cars, with either native (dirt) or processed material (for example, gravel) surfaces.
- Level 4 Roads: Open for moderate travel speeds in standard passenger cars, typically with smooth aggregate surfaces and double lanes.
- Level 5 Roads: Roads maintained to the highest standards. Provide a high level of user comfort, and are typically double lane paved facilities.

Figure 3.12–1 shows there is an existing network of Level 2 and wildcat roads on the west side of the Tumacacori Mountains. The yellow markers on the map indicate locations where minor repairs, such as repairing erosion damage, breaking rocks, removing brush, or reducing a hump, would be necessary for project construction. Where the Western Corridor runs along Ruby Road, this graded gravel Level 3 road would provide primary construction access. East of Peña Blanca Lake, Ruby Road becomes a Level 4 paved asphalt two-lane road heading northeast for 9.5 mi (15 km) to I-19. As Ruby Road bears to the northeast away from the proposed ROW, the access would be indirect using existing wildcat roads that follow the canyons which intersect the proposed ROW.

The Western Corridor joins the Central and Crossover Corridors, and the EPNG pipeline ROW, where the access again would follow the pipeline access dirt road. At the point the corridors separate from the EPNG pipeline ROW (approximately 0.75 mi [1.2 km] west of the proposed Gateway Substation), project access would be primarily on existing dirt trails in the area. Public roads within Nogales would be utilized to access the structures from the Gateway Substation to the U.S.-Mexico border.

3.12.2 Central Corridor

The primary points of access along the Central Corridor would be similar to those for the Western Corridor. The Central Corridor parallels the Western Corridor from the South Substation to the point where the Western Corridor separates from the EPNG pipeline ROW. Continuing to follow or cross the EPNG pipeline ROW, access to the Central Corridor would be on existing pipeline access trails, many of which would require upgrade to meet TEP's construction needs. There are several washes where the access for the proposed ROW may diverge from the pipeline ROW access to reduce the need for grading and mitigate impact to the wash areas.

To the south of Arivaca Road near Amado, the Central Corridor access would be from I-19 and the frontage roads which access the ranch or canyon roads leading to the pipeline ROW. The existing dirt access roads would be used wherever possible.

Within the Tumacacori EMA, as shown in Figure 3.12–1, existing Level 2 roads and wildcat roads would provide access to a majority of the Central Corridor. This would continue as the preferred method of access to the point where the Central Corridor rejoins the Western Corridor west of Nogales. Within the vicinity of the Central Corridor, approximately 65 percent of the existing roads are wildcat roads, with the remaining 35 percent being USFS classified roads (URS 2003a).

Access to the three overlapping corridors from the point of overlap to Nogales and the U.S.-Mexico border would be the same as described for the Western Corridor.

3.12.3 Crossover Corridor

The primary points of access along the Crossover Corridor would be similar to those for the Western Corridor. The Crossover Corridor parallels the Western Corridor from the South Substation to the point within the Tumacacori EMA where the Crossover Corridor turns east at Peck Canyon, and access in this common segment would be as described above for the Western Corridor. Within Peck Canyon on the segment unique to the Crossover Corridor, existing access is limited to wildcat roads. This area is within an IRA, as described in Section 3.1, Land Use. Upon joining with the EPNG pipeline ROW and Central Corridor, access to the Crossover Corridor would be on existing pipeline access trails. This would continue as the preferred method of access to the point where the Crossover Corridor rejoins the Western Corridor west of Nogales. Within the vicinity of the Crossover Corridor, approximately 58 percent of the existing roads are wildcat roads, with the remaining 42 percent being USFS classified roads (URS 2003a).

Access to the three overlapping corridors from the point of overlap to Nogales and the U.S.-Mexico border would be the same as described for the Western Corridor.

3.12.4 115-kV Interconnection of the Gateway and Valencia Substations

The majority of the proposed 115-kV transmission line interconnection passes through lands classified by Arizona Department of Transportation (ADOT) as planned Transportation Corridor areas. There are a number of existing arterial roads including I-19, US 89, and Mariposa Road (Highway 189) within the project area. The proposed interconnection crosses both Mariposa Road and I-19.

3.13 MINORITY AND LOW-INCOME POPULATIONS

Executive Order (EO) 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* (59 FR 7629, 16 February 1994), directs each Federal agency to "make…achieving environmental justice part of its mission" and to identify and address "…disproportionate high and adverse human health or environmental effect of its programs, policies, and activities on minority and low-income populations." The Presidential Memorandum that accompanies EO 12898 emphasized the importance of using existing laws, including the *National Environmental Policy Act* (NEPA), to identify and address environmental justice concerns, "including human health, economic, and social effects, of Federal actions."

The Council on Environmental Quality (CEQ), which oversees the Federal government's compliance with EO 12898 and NEPA, has subsequently developed guidelines to assist Federal agencies in incorporating the goals of EO 12898 into the NEPA process. This guidance, published in 1997, was intended to "…assist Federal agencies with their NEPA procedures so that environmental justice concerns are effectively identified and addressed" (CEQ 1997a). Pursuant to EO 12898, this section identifies possible minority or low-income populations that might be subject to disproportionately high and adverse environmental impacts or health effects from the proposed Tucson Electric Power Company (TEP) Sahuarita-Nogales Transmission Line Project.

Methodology

The following discusses the methodology that the U.S. Department of Energy (DOE) used to identify possible minority and low-income populations in the project area.

Minority Populations. Environmental justice guidance defines "minority" as individual(s) who are members of the following population groups: American Indian or Alaskan Native; Asian or Pacific Islander; Black, not of Hispanic origin; or Hispanic (CEQ 1997a). The Council identifies these groups as minority populations when either (1) the minority population of the affected area exceeds 50 percent or (2) the minority population percentage in the affected area is meaningfully greater than the minority population percentage in the general population or appropriate unit of geographical analysis.

For this Environmental Impact Statement (EIS), DOE followed the environmental justice methodology used in the Durango Area Drainage Master Plan (ADMP) that was prepared for the Flood Control District of Maricopa County, Arizona, and submitted to the Federal Emergency Management Agency and the U.S. Army Corps of Engineers (Dibble 2000). This methodology is based on CEQ's definition of minority populations, and expands upon the second criterion above by defining a "meaningfully greater" minority population if:

- It has proportions of ethnic minority groups that are at least an additional 10 percent greater than that tabulated for the United States in the 2000 census (i.e., minority percentage plus an additional 10 percent). Using this formula, the following are the specific ethnic minority thresholds used for this evaluation: (1) African American – 22.3 percent or greater, (2) American Indian, Eskimo, Aleut – 10.9 percent or greater, (3) Asian, Pacific Islander – 13.7 percent or greater, (4) Persons of Hispanic Origin – 22.5 percent or greater, and (5) Other race – 15.5 percent or greater (Census 2000d).

Since the Durango ADMP project was located in one of the most disadvantaged sections of Phoenix, Arizona, and the Durango ADMP was accepted by several Federal agencies, DOE determined that the Durango ADMP environmental justice methodology would be suitable for this EIS.

Applying the previously discussed criterion to identify minority populations, the following section details the minority composition of the area in close proximity to the proposed transmission corridors utilizing census block group data (data available from the 2000 Census that divide counties into census block groups for analysis).

Low-Income Populations. Environmental justice guidance defines "low-income" using statistical poverty thresholds from the Bureau of Census Current Population Reports, Series P-60 on Income and Poverty, by household (Census 2001). In identifying low-income populations, a community may be considered either as a group of individuals living in geographic proximity to one another, or a set of individuals (such as migrant workers or Native Americans), where either type of group experiences common conditions of environmental exposure or effects.

For this EIS, DOE followed the environmental justice methodology used in the Durango ADMP (Dibble 2000), for the reasons previously discussed. The methodology for identifying low-income populations in the Durango ADMP is based on CEQ's definition of low-income households, and establishes a threshold above which a population is considered to be a low-income population if:

- It has proportions of low-income households that are at least an additional 10 percent greater than that tabulated for the United States in the 2000 Census (i.e., incomes less than or equal to the official 2000 poverty rate of $17,463 for a family of four). Using this formula, the specific low-income threshold used for this evaluation is 23.3 percent (i.e., the national poverty level of 13.3 percent plus an additional 10 percent) (Census 2000d).

Applying the above criterion to identify low-income populations, the following section details the low-income composition of the area in close proximity to the proposed transmission corridors utilizing census block group data (similar to the Durango ADMP) from the 2000 Census.

3.13.1 Western, Central, Crossover Corridors, and 115-kV Interconnection of the Gateway and Valencia Substations

Figures 3.13–1 and 3.13–2 present the census block groups in the project area and identify which of these census block groups have meaningfully greater minority and low-income populations, respectively. (Figure 3.13–3 shows the detail of block group boundaries for populated areas.) Tables 3.13–1 and 3.13–2 present the census block group data for Pima County and Santa Cruz Counties, respectively, that DOE used to prepare Figures 3.13–1 and 3.13–2. As shown in these figures, ten census block groups are intersected by the Central Corridor, and eleven census block groups are intersected by the Western and Crossover Corridors. Four of the intersected census block groups are in Santa Cruz County, and the remaining intersected census block groups are in Pima County.

Figure 3.13–1 shows that five of the intersected census block groups for the Central Corridor, and six of the intersected block groups for the Western and Crossover Corridors, exceed the meaningfully greater minority population percentage (of 22.5 percent for Hispanics, or of 10.9 percent of American Indians in the case of the block group on the San Xavier District Tohono O'Odham Reservation). None of the census block groups exceed the meaningfully greater minority population percentages for other minorities listed in the Methodology section.

Figure 3.13–2 shows that the one census block group that is intersected by all three proposed corridors exceeds the low-income population threshold value of 23.3 percent of households.

Table 3.13–1. Pima County Census Block Groups On and Near the Corridors

Block Group ID	Total Pop	One Race						Two or More Races	Hispanic		Below Poverty Level	Intersect Corridor?			Percent Minority[a]	Percent Below Poverty Level
		White	African American	American Indian	Asian	Pacific Islander	Other		Non-Hispanic	Hispanic		Western	Crossover	Central		
9409001	1940	548	0	1294	0	0	16	82	1502	438	479				67%	25%
0043131	4701	3241	64	70	15	0	1108	203	2804	1897	1050				40%	22%
0041091	1588	1386	15	77	8	0	78	24	1342	246	60				15%	4%
0041061	7804	4818	647	285	19	13	1538	484	4045	3759	892				48%	11%
0043163	1247	1091	0	24	5	0	70	57	908	339	260	Y	Y		27%	21%
0043162	366	362	0	0	0	0	4	0	359	7	72	Y	Y	Y	2%	20%
0043142	526	377	0	12	0	0	134	3	293	233	53	Y	Y	Y	44%	10%
0043161	753	612	0	40	0	0	93	8	577	176	55	Y	Y	Y	23%	7%
0043164	1513	1170	0	0	16	0	226	101	702	811	304	Y	Y	Y	54%	20%
0041071	2944	2562	27	64	14	0	206	71	2203	741	304				25%	10%
0041081	2411	2109	12	3	0	0	217	70	1713	698	244				29%	10%
0043141	3073	2805	4	7	27	0	179	51	2433	640	182				21%	6%
0043181	1226	1142	0	0	0	0	24	60	1122	104	72				8%	6%
0043171	839	839	0	0	0	0	0	0	839	0	34				0%	4%
0043071	1144	1113	5	0	4	0	22	0	1084	60	26				5%	2%
0043172	859	859	0	0	0	0	0	0	838	21	18				2%	2%
0043182	2025	2020	0	0	5	0	0	0	1952	73	39				4%	2%
0043183	1024	987	0	14	0	0	0	23	1004	20	47				2%	5%
0041072	145	141	0	0	3	0	0	1	121	24	27				17%	19%
0043072	733	733	0	0	0	0	0	0	721	12	6				2%	1%
0043173	1223	1195	7	0	0	0	13	8	1196	27	52				2%	4%
0043151	2349	2313	0	5	10	0	17	4	2227	122	26	Y	Y	Y	5%	1%
0043152	2666	2656	0	0	0	0	0	10	2646	20	70				1%	3%
0043184	718	714	0	0	0	0	4	0	709	9	0				1%	0%
0043073	772	772	0	0	0	0	0	0	723	49	15				6%	2%
0043074	649	649	0	0	0	0	0	0	642	7	46				1%	7%
0043153	982	953	17	0	0	0	12	0	964	18	50				2%	5%

[a]Percent minority is based on percent Hispanic, as this is the largest minority, except in Block Group 9409001 on the San Xavier District Tohono O'Odham Reservation, where American Indians are the largest minority.
Source: Census 2000d.

Table 3.13–2. Santa Cruz County Census Block Groups On and Near the Corridors

Block Group ID	Total Pop	One Race						Two or More Races	Hispanic		Below Poverty Level	Intersect Corridor?			Percent Minority[a]	Percent Below Poverty Level
		White	African American	American Indian	Asian	Pacific Islander	Other		Non-Hispanic	Hispanic		Western	Crossover	Central		
9960001	858	792	4	8	3	0	34	17	748	110	42				13%	5%
9960002	854	763	0	13	3	0	67	8	541	313	214				37%	25%
9960003	318	272	0	4	0	0	25	17	245	73	61				23%	19%
9961011	402	339	0	0	13	0	26	24	297	105	65	Y	Y	Y	26%	16%
9961012	598	598	0	0	0	0	0	0	587	11	19	Y	Y	Y	2%	3%
9961013	766	627	0	16	0	8	108	7	335	431	73				56%	10%
9961021	5375	3692	67	15	44	0	1337	220	1441	3934	532				73%	10%
9961022	5900	3862	12	32	163	0	1681	150	914	4986	803	Y	Y	Y	85%	14%
9961023	1278	930	0	0	17	0	320	11	57	1221	448				96%	35%
9961024	322	296	2	0	0	0	22	2	149	173	22				54%	7%
9962001	296	289	0	0	0	0	0	7	26	270	85	Y	Y	Y	91%	29%
9962002	2627	2122	0	10	0	0	484	11	100	2527	1210				96%	46%
9963001	889	687	0	0	2	0	200	0	134	755	120				85%	13%
9963002	2872	2143	11	0	0	0	634	84	103	2769	554				96%	19%
9963003	1546	1212	0	0	0	0	334	0	38	1508	564				98%	36%
9963004	2425	1670	12	8	8	0	705	22	131	2294	1207				95%	50%
9964011	1529	1249	0	0	0	0	149	131	103	1426	392				93%	26%
9964012	2116	1566	5	14	17	0	438	76	69	2047	766				97%	36%
9964021	2274	1793	0	54	39	0	319	69	237	2037	637				90%	28%
9964022	2725	2055	6	58	0	0	529	77	91	2634	1279				97%	47%

[a]Percent minority is based on percent Hispanic, as this is the largest minority.
Source: Census 2000d.